Cranfield University

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Foraging patterns of the wood ant *Formica rufa* Linnaeus (Hymenoptera: Formicidae) at Burnham Beeches, Buckinghamshire

Innovation and Technology Assessment Unit

School of Industrial and Manufacturing Science

PhD Thesis

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Supervisor: Dr. Steven Cousins

December 1998

Abstract

This thesis describes a study on the foraging ecology of the wood ant *Formica rufa* Linnaeus (Hymenoptera: Formicidae) at Burnham Beeches, Buckinghamshire over the period January 1994 to June 1996. Detailed observations were made on the foraging behaviour during this period and the food supply of two colonies was experimentally altered by food supplementation and food denial through grease-banding of trees within a 50 m by 50 m area centred on the nest. The foraging areas of *F. rufa* colonies were determined by observing trails to trees and showed seasonal variation. The size of the foraging areas, their tree composition, the mean distance travelled by foragers and the extent to which particular trees were repeatedly foraged were monitored. There was stability in foraging areas between years due to colony persistence. Food supplementation did not alter the foraging area of the nest. There was some evidence that the extra resources were channelled into producing more sexuals. Food denial caused the denied nest to expand its foraging area.

The amount of honeydew collected by *F. rufa* was experimentally determined. The amount of prey taken was estimated from a survey of the literature. The proportion of net primary productivity moved by a *F. rufa* colony across its foraging area was estimated as 0.12 % to 0.47 %.

The effects of the distribution of *F. rufa* on other ground living invertebrates was experimentally investigated. The presence of *F. rufa* was found to be significantly negatively correlated with the presence of predatory Coleoptera and significantly positively correlated with the presence of the myrmecophilous staphylinid beetle *Zyras humeralis* (Gravenhorst).

The monitoring of the foraging areas and determination of the relationship between the presence of *F. rufa* and other ecological groupings allows this work to be used to inform the ETM framework, a proposal for spatially delineating ecosystems.

Acknowledgements

More than once it was commented that this might well be my longest chapter because there were so many people I have to thank for their help during the five years this thesis took to complete. I am happy to say I managed to write quite a few more pages!

I would like to start by thanking my supervisor Dr. Steven Cousins and acknowledge the financial support of IERC. I would like to thank other staff at IERC (past and present) for their support over the last five years, in particular: Janice Evans, Professor Martyn Cordey-Hayes, Maureen Mahoney, Dr. Jamie McGlade and Rosie Teggarty. My fellow students shared with me the ups and downs of the PhD process. I thank all of them for being there for me, in particular Noemi De la Ville, Linda Hadfield, Peter Hiett, Matt Hinton and Jane Scamans. I should like to thank Kim Seaton for generously agreeing to translate a long and difficult German paper.

Cranfield University stores catered for some unusual requests and manfully rose to the occasion when I needed things built, glued and sawed. Many thanks to Pete Pousson and the rest of the "lads".

Although I left the International Institute of Biological Control many years ago, I still keep in contact with many of my former colleagues. I should like to thank them all for their support. I should just like to mention a few people who have been particularly important to me over the last five years: Tony Cross, Simon Fowler, Annette and David Greathead (who suggested working on ants), Sean Murphy (who introduced me to Professor Michael Way and Mike Cammell) and last, but not least, my dear friend Yvonne Abraham. I should also like to thank Chris Hamilton for allowing me to use the CABI Silwood library and for his support over the years. Joanna Kapusta is a friend as well as a librarian.

Simon Hoy suggested Burnham Beeches as a good site for working on wood ants. I would like to thank Superintendent Ian Turney and Head Keeper, Mark Frater for permission to carry out field work in Burnham Beeches and for the loan of equipment. I would like to thank the Ecologist, Dr. Helen Read, for all her help and advice; Administrative Officer, Jackie Haines and the Keepers, Austin Brewer, Roy Marston, Nick Haugh, Ed Gilbert, Dan Noble and Jeremy Young, for keeping me safe when I was alone in the woods. I should also like to thank Peter Hammond from the Natural History Museum for help with beetle identification.

The whole site foraging counts required a team of volunteers, all unpaid, who gave their time to spend long days in Burnham Beeches. Without them I could never have sampled so many trees. My sincere thanks go to the following who all helped on one or more counts: Mike Cammell, Gen Cannibal, Steven Cousins, Pablo and Eliza Ferreras, Derek Harvey, Peter Hiett, Matt Hinton, Richard Lilley and Robert Shipp.

During the course of this research, I have made contact with other ant workers. They are all extremely friendly and helpful whether in person or on the end of an email.

When I first decided to use ants as an experimental system, I was introduced to Professor Michael Way and Mike Cammell who have worked with ants for many years. They immediately agreed to help, much to my surprise and relief. Little did they know what they were letting themselves in for! Their help and advice, with both practical and written work, was invaluable, and their enthusiasm and seemingly limitless knowledge of the natural world never ceases to amaze me.

In particular I should like to express my sincere thanks to Mike Cammell for all his help with all aspects of the fieldwork and in the laboratory. He not only gave sound advice but spent many hours in the field with me. He was always in a buoyant mood, a constant tower of strength through all the lows, and has the enviable ability to make learning fun. He (and Michael Way) also read all my written work, covering it with constructive comments. I could not have completed this thesis without him.

I should like to thank collectively the members of the social insects mailing list for answering all my questions and mention Dr. Sanford Porter for maintaining the FORMIS 95 database of ant literature - an invaluable source of reference. Andrzej Wrotniak provided a program over the internet to calculate the area of a polygon which used to calculate wood ant foraging areas. I would like to thank Dr. Greg Peakin and Simon Blanford for sharing with me their experiences and data from their work in Burnham Beeches at the beginning of my research.

I met Dr Phil Wright and Uche Chukwu quite late on in this research when they kindly agreed to explain their method for collecting honeydew laden ants. I thank them both for their support. In particular I should like to thank Phil for generously giving up his time to talk to me and read a complete draft of my thesis.

I should like to thank John Bladgen and John Harrington at the Cranfield University Library for giving me a part-time job which has enabled me to support myself for the last two years. Their tolerance, flexibility and support for my work has gone far beyond anything I could have hoped for from an employer. All the staff at the library have been understanding, but in particular I would like to mention those I work most closely with who have supported me through some difficult times: Anita Beal, Doreen Dunbar, Tricia Rogerson, Pat Taylor and Sarah Watson. The lack of ecological literature in the library meant I was a heavy user of the interlibrary loans service. My thanks go to them for the efforts to respond to all my requests as quickly as possible.

I should like to thank my friends for putting up with me over the last five years. They have always been there for me through good and bad times, in particular: Yvonne Abraham, Richard Lilley and Richard Yates. I would also like to thank Trevor Mudd for building me a high-sided wooden quadrat which helped to stop the ants escaping!

Angela Scott and Derek Harvey have been my friends for many years and I hope many more to come, I thank them for their love and support. Derek contributed much to this thesis. His knowledge of natural history puts mine to shame and I should to thank him for all his valuable input into this research, in particular for identifying most of the invertebrates in the pitfall traps, drawing the pictures of *Formica rufa*, helping with the food web diagram, reading my thesis and helping me to express my ideas more clearly.

I should like to thank my family for their unconditional love, in particular my brother and sister-in-law for being there when I needed them, my Mum for not screaming when I filled her fridge with dead insects and my Dad for tolerating my raids on his hallowed shed. I apologise to my beloved nephews; Allan, Jason, Stephen and Christopher for not always having time to play with them. Being with them is always a happy occasion, their excitement, happiness and enthusiasm for life is a source of great joy.

And finally, I would also like to express my sincere thanks to Peter Hiett who helped with just about everything. He provided constant support through the ups and downs of the last five years, put in long hours in the field with me, helped me to think clearly about my ideas and read any written work. I could not have survived the last five years without him. Thank you seems so inadequate.

This thesis is dedicated to the two people who I relied on most over the last five years

Mike Cammell and Peter Hiett

Thank you for everything

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Chapter 1: The foraging behaviour of ants

1.1 Introduction

Ants are the most abundant and widely distributed social insect; 8,800 known species cover most of the terrestrial world from the Arctic Circle to the southern most tips of Tasmania, Tierra del Fuego and southern Africa (Hölldobler and Wilson 1990). Biomass studies in the tropics suggest that one third of the entire animal biomass of the Amazonian rain forest is composed of ants and termites (Gotwald 1986; Hölldobler and Wilson 1990). The local diversity of ant species is substantial as ants have evolved to fill a wide range feeding niches in the soil and vegetation (Hölldobler and Wilson 1990). Their impact on the terrestrial environment is correspondingly great (Risch and Carroll 1982). It is now well established that ants rival earthworms in their capacity to modify and transform soil (Gotwald 1986). In most terrestrial habitats they are among the leading predators of other invertebrates (Hölldobler and Wilson 1990). These attributes make many ant species potentially important as biological control agents in agriculture and forestry (Risch and Carroll 1982; Majer 1986; Way and Khoo 1992). However, ants can also be important pest species, for example, the red imported fire ant (*Solenopsis wagneri* Santschi (= *S. invicta* (Buren))) in North America (Lofgren 1986).

Wood ants in particular have been a natural subject for study; they are successful, conspicuous central place foragers. Studies on the amount and type of food collected are possible (Jenson 1978; Skinner 1976). Workers can be marked individually or en mass for studies such as route fidelity (Dobrzańska 1958; Rosengren 1971) and recruitment (Gordon, Rosengren and Sundström 1992).

Wood ants are generalist predators and ideal candidates for a 'keystone' role in woodlands, being large, aggressive and often very abundant (Fowler and MacGarvin 1985). Work by Haemig (1992) showed how aggressive they can be. He found that birds which foraged for insects on the bark or foliage of trees (tits, warblers, woodpeckers and treecreepers) visited trees without *Formica aquilonia* Yarrow more frequently and for longer periods than trees with *F. aquilonia*.

The *Formica rufa* group consists of eight species in central Europe, and *Formica polyctena* Förster, *Formica lugubris* Zetterstedt and *F. aquilonia* in particular have been well studied (Cotti 1963), especially in Germany and Italy, mainly due to their potential importance as a biological control agent (Adlung 1966; Greathead 1976). In addition, the introduction of *F. lugubris* to Canada in 1971 as a biological control agent of forest pests was carefully monitored (Finnegan 1975, 1979).

In Britain four species of the *Formica rufa* group are present: *Formica rufa* Linnaeus occurs widely throughout England and Wales; *Formica pratensis* Retzius is found only in Dorset; *F. lugubris* occurs in northern England and Scotland and *F. aquilonia* occurs in Scotland (Barrett 1968).

The ant chosen for this study was *F. rufa* in Burnham Beeches NNR and SSSI, Buckinghamshire, England. Work in the UK, on *F. rufa*, has been limited. The study by Skinner (1976, 1980a, b) on the ecology of *F. rufa* in a limestone pavement woodland is the most comprehensive, with follow up work by Skinner and Whittaker (1981), Warrington and Whittaker (1985a, b), Whittaker and Warrington (1985) and Mahdi and Whittaker (1993). There are also a number of other published (Elton 1932; North 1993) and unpublished studies (Adams 1991; Hammond 1992; Blanford 1994; Stevens 1995) on aspects of its ecology.

Skinner (1980b) showed how the foraging area of six nests varied between the summer of 1973 and the spring of 1974. There are no other studies in the UK on *F. rufa* which look in detail at how foraging patterns change within and between years. Thus, a major part of this thesis focuses on how the foraging area of a number of *F. rufa* colonies changed spatially and temporally from January 1994 to June 1996. Changes in foraging on a large number of individual trees were tracked. In addition, the food supply to two nests was manipulated to see how extreme changes in food supply affected their foraging behaviour.

Wood ants, as central place foragers, are ideal candidates for energetic studies as all the food collected is brought back to the nest. The amount of honeydew carried by *F. rufa* was experimentally investigated and using the information gathered on foraging areas, estimates were made on the amount of energy gathered by individual colonies. The literature on energetic studies of *Formica* spp. was reviewed and compared to the results of this study.

F. rufa is locally dominant and it is hypothesised that its presence affects the distribution of other ground living invertebrates, giving the local community food web a spatial and temporal structure. Pitfall trapping within and between years was used to give insight into the influence of *F. rufa* on other ground living invertebrates. The literature on the interaction between *Formica* spp. and other invertebrates was reviewed and compared to the results of this study.

Perry and Pianka (1997) reviewed how studies in foraging behaviour have proliferated over the past thirty years. Generally there has been a divide between theorists and empiricists; although over the last decade there has been a move towards combining theory with observation, empiricists have been unenthusiastic about testing theoretical predictions and theoreticians equally unenthusiastic about incorporating reality into their models. Kareiva (1994) feels that despite the potential influences of space on ecology, there is a lack of sustained experimental investigations that test ideas. The Ecosystem Trophic Module (ETM) (Cousins 1990) is one such highly theoretical framework which takes the concept of stability in space to its limit. The experimental results from this thesis can be used to illustrate and inform some components of this framework.

1.2 Aims of the thesis

This thesis has five aims:

1. To experimentally investigate how foraging areas of *F. rufa* colonies change within and between years.
2. To experimentally investigate the effect of changes in food supply on the foraging behaviour of *F. rufa*.
3. To experimentally investigate how much honeydew is carried by *F. rufa* and to estimate the amount of energy gathered by individual colonies.
4. To experimentally investigate how the distribution of *F. rufa* affects the distribution of other ground living invertebrates.
5. To describe how the results of the experimental investigations can be used to illustrate the theoretical concept of an ETM and comment on the implications for the future development of the ETM framework.

1.3 Brief chapter summaries

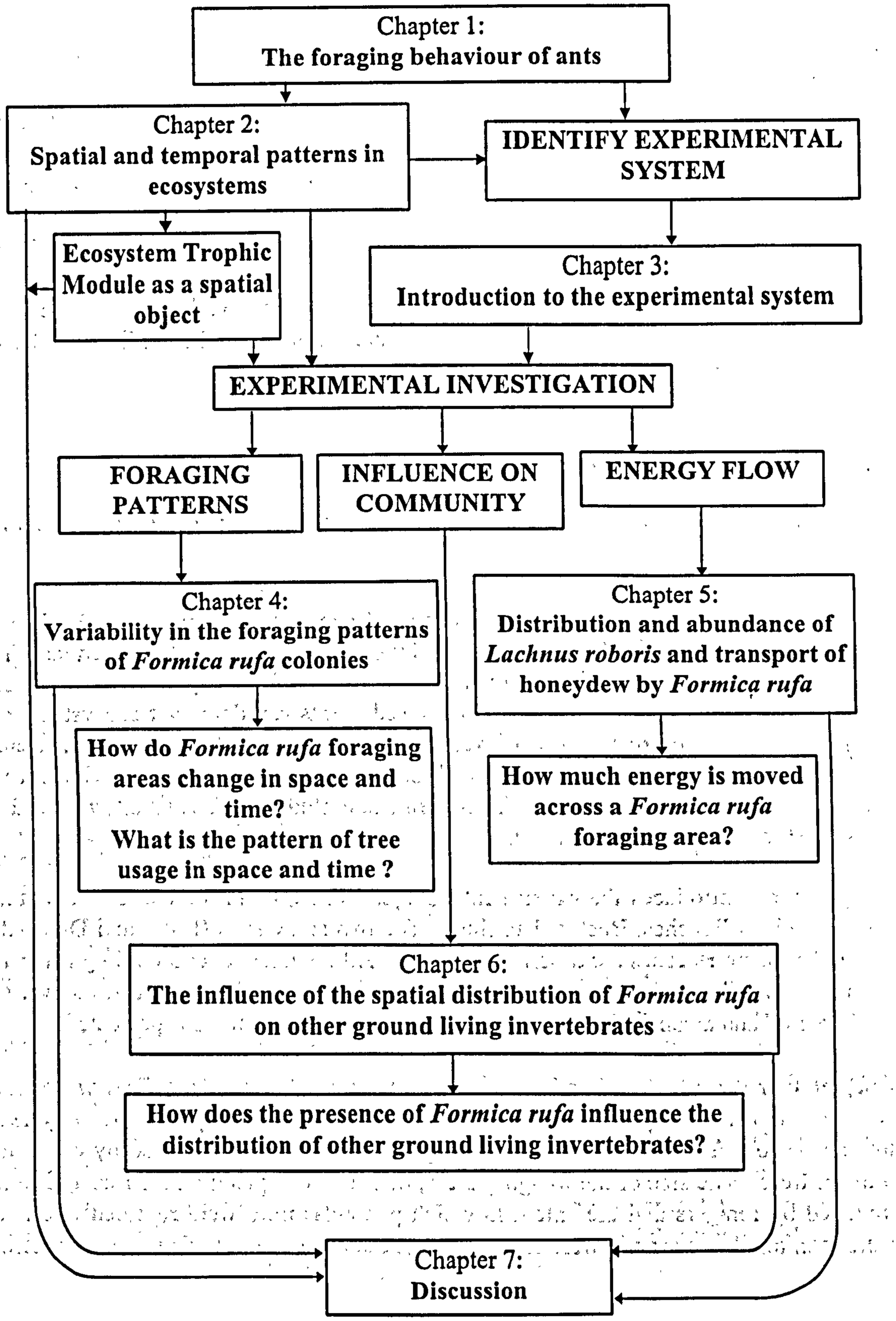
The chapters of the thesis are briefly summarised below and the thesis structure is shown in Figure 1.1.

Chapter two reviews the literature on the spatial and temporal foraging behaviour of ants, ecosystems and food webs Optimal foraging theory is briefly described The literature on territory and trail formation in ants, effects of a changing food supply and energy flow through ant populations is reviewed. Ants can dominant ecosystems and the literature on their effect on other invertebrates is examined. Literature on the spatial and temporal structuring of ecosystems and food webs is briefly reviewed. The ETM is discussed and how the results of the experimental study of *F. rufa* can be used to illustrate the framework are outlined.

Chapter three introduces the experimental subject, *F. rufa* and the chosen field study area, Burnham Beeches, Buckinghamshire. The two study sites (Halse and Dimsdale) within Burnham Beeches are described in detail. All the trees (over 5 cm in girth at 1.5 m in height) and *F. rufa* nests were mapped. A nest activity survey was carried over the study period and an analysis of the distribution of trees around nests is presented.

Chapter four describes in detail changes in foraging patterns of the *F. rufa* colonies within each of the study sites that were monitored over the study period (January 1994 to June 1996). The foraging areas of *F. rufa* colonies were determined by observing trails to trees. The size of the foraging areas, their tree composition, the mean distance travelled by foragers and the extent to which particular trees were repeatedly foraged were monitored. Four nests were chosen, two at each site, to be studied in more detail.

Figure 1.1: Thesis structure



In 1995 and 1996, one nest at Dimsdale was given supplementary food and one nest at Halse had its access to food supply in the tree canopy restricted by putting grease-bands around tree trunks. Each modified nest had an appropriate control nest at that site whose food supply was not artificially altered.

Chapter five uses the foraging areas established in chapter four to estimate the amount of energy by individual nests across foraging areas in Dimsdale and Halse. The main sources of energy are honeydew, obtained by tending the aphid *Lachnus roboris* (Linnaeus), and protein, obtained from insect prey. The distribution and phenology of *L. roboris* were studied. The amount of honeydew carried by *F. rufa* workers was experimentally investigated and an estimate of the amount of insect prey taken was made from the literature.

Chapter six describes pitfall trapping between nests and in an area where *F. rufa* is not present. This shows the distribution of *F. rufa* and other ground living invertebrates in relation to each other.

Chapter seven concludes the thesis with a discussion of the possible foraging strategy of the *F. rufa* colonies in Burnham Beeches in the context of a changing food supply. The implications of the results for the study of the ETM framework are discussed.

Chapter 2: Spatial and temporal patterns in ecosystems

2.1 Spatial and temporal structuring of foraging behaviour in ants

For all consumers, the world is heterogeneous, food is patchily distributed in space and time. Different foraging strategies emerge depending on the relative spatial and temporal availability of prey items. It is the aim of optimal foraging theory to predict the foraging strategy to be expected under specified conditions (Begon, Harper and Townsend 1986, p. 331). Foraging theory is briefly reviewed here before discussing the different strategies of ant species.

2.1.1 Optimal foraging theory

The mathematical treatment of foraging theory began with Emlen (1966) and MacArthur and Pianka (1966) who identified the costs and benefits associated with a range of activities and introduced optimal foraging theory. Foraging behaviour has two principal interlocking components, the search for, and the retrieval of, food items. It is feasible, in theory at least, to assess the relative importance of the two components by equating them in terms of energetic cost and gain (Hölldobler and Wilson 1990, p. 379). Schoener (1971) introduced two measures of foraging success which have become standard; maximisation of energy intake rate, and minimisation of time necessary to obtain nourishment.

Foraging theory is composed mainly of optimality models. Optimality is the expected result of natural selection over evolutionary time, producing organisms best able to acquire resources (Perry and Pianka 1997). The marginal value utilised, the "currency", is usually energy. The modellers visualise the organism as seeking to maximise its net energetic yield. There are four basic ways to modify behaviour (Hölldobler and Wilson 1990, p. 378):

1. Choice of food items (optimum diet),
2. Choice of food patch (optimum food patch)
3. Allocation of time invested in different patches (optimum time budget)
4. Regulation of the pattern and speed of movement.

The idea of the marginal value theorem was introduced by Charnov (1976). The optimal time spent in a food patch should be defined in terms of the rate of energy extraction experienced by the forager as it leaves the patch (the marginal value of the patch). Foraging in an environment where the food is patchily distributed, the forager should leave the food patches, irrespective of their profitability, at the same extraction rate (i.e. the same marginal value). Thus time spent in more productive patches will be greater than in less profitable patches. For patches below the marginal value, stay time should be zero. The predictions that foraging ants should spend more time in high quality food patches was recently tested by Bonser, Wright, Bament and Chukwu

(1998) with *Lasius niger* (Linnaeus). As the concentration of the sucrose solution increased, the feeding time of the foragers also increased.

Optimal foraging patterns are generally thought to be constrained by two forces, one external to the organism such as mortality due to accidents, disorientation and predation, and one internal such as the limited sensory and psychological capacities of organisms (Hölldobler and Wilson 1990, p. 378).

Central place foraging is a special case where the foraging patterns are analysed in terms of trips from a central location. This applies to ants and other animals with a nest or other permanent retreat (Hölldobler and Wilson 1990, p. 378). The special case of social insects was theoretically treated by Oster and Wilson (1978).

Central place foraging in ants has a special set of models (Orians and Pearson 1979; Schoener 1979; Stephens and Krebs 1986). The reasoning must be modified to accommodate social insects which commit expendable "energy packets" in the form of nonreproductive workers. The number of workers and hence the energy costs can be fitted through mass communication to the spatial distribution of food items and thus to the yield of energy moment by moment. Workers can specialise on particular sectors and on different types of food items. The key assumption is that the more energy expended getting to a food patch, the larger the energy package which should be brought home.

Theories of foraging strategy provide an important organisational framework, but optimisation models should be cautiously applied because the economics of foraging cannot be studied in isolation from other aspects of ecology, energetics, social organisation and the intrinsic behavioural limitations of the ants. Tests of theory have shown varying degrees of correspondence between ant foraging behaviour and the predictions of models (Traniello 1989). It is very rare that an animal can focus on feeding to the exclusion of all other factors such as predation risk and finding a mate (Perry and Pianka 1997), as well as the constraints noted above.

The work by Holder Bailey and Polis (1987) who set out to test some predictions of optimal and central place foraging on the desert harvester ant, *Pogonomyrmex californicus* (Buckley) which harvests seeds, provides an excellent example. The results were mixed. Large and medium seeds were both significantly preferred over small seeds a maximisation of net energy intake, as predicted by optimal foraging theory. However, as the abundance of large and medium seeds decreased, the ants harvested a significantly greater proportion of small seeds even though large seeds were still commonly available. Optimal foraging theory predicts that the abundance of low ranking food items does not determine its inclusion in the diet. Central place foraging theory predicts that as the distance from the colony increases, ants will become increasingly more selective and choose food items of the highest food value. The results of the experiments to test this showed that distance had no effect on the proportions of large, medium and small seeds harvested. However, Holder Bailey and Polis suggested an explanation. The theoretical model assumes travel time to be

constant regardless of size or weight of the prey item. Clearly for ants commonly harvesting food items as big or bigger than their own body weight, travel times can be extremely variable. Since return time is an important component of the equation, there will come at point at which it is actually more profitable to harvest a smaller food item.

Optimal foraging theorists are becoming aware of how complex the demands on an organism are and accepting, therefore, that simple models will not make useful predictions (Perry and Pianka 1997). Progress depends upon linking theory and facts (Kacelnik 1993). Well designed experiments, such as those by Holder Bailey and Polis (1987), are invaluable if the theory is to progress.

2.1.2 Territory and trail formation

The principal ecological determinants of ant foraging strategy are the distribution of food resources in size, time, space and quality; competition with sympatric ant species and predation. A colony is generally sessile and therefore the resource and competitive environment is in essence defined by its location. Therefore, a colony must spatially pattern foraging to harvest food efficiently and minimise competition (Traniello 1989).

The establishment of a territory should only occur when the territory's size and design is defensible in energetic terms, i.e. territorial defence should gain more energy than it consumes. Distinct strategies are associated with the stability and predictability of food items in space and time (Hölldobler and Wilson 1990, p. 401), which are briefly reviewed here.

Where resources are uniformly distributed and continuously renewed, it is advantageous to maintain complete defence. *Oecophylla longinoda* (Latreille), the African weaver ant, is the best example of such a strategy. It is a predaceous ant which dominates the forest canopy in a large part of tropical Africa. Nests are made of leaves bound together by silk spun by final-instar larvae. Each colony has hundreds of nests distributed over several trees, but there is only one queen who resides in one of the nests protected by workers. The remaining nests are filled with brood and workers. Colonies are large, a typical mature colony might have more than 500,000 workers. They are highly aggressive, defending every part of their territory, especially against workers from a different colony. Their territories are three dimensional as prey is hunted for in the canopy and on the ground. There is a sharp divide between different colonies (Hölldobler and Lumsden 1980).

In contrast, when resources are patchily distributed and are unpredictable or unstable, the most efficient system is to only defend the portions within which ants are foraging, a temporary temporal territory. *Myrmecocystus mimicus* Wheeler, the honeypot ant, uses this strategy. It is abundant in the mesquite-acacia community of the southwestern USA where it preys on termites, the spatial and temporal distribution of which is highly unpredictable. When a food supply has been discovered by foragers, some rush back to the nest and recruit hundreds of workers. Encounters with other foragers from other nests are common, as there are no defined territories. However, these encounters are

rarely violent as this would result in a heavy and constant drain on workers. Instead there are tournaments of fighting display instead of physical combat. Only when one colony is considerably weaker than the other is it raided, the queen killed and the workers enslaved (Hölldobler and Lumsden 1980).

The trunk trail territory system, used by wood ants amongst others, is most efficient when resources are patchily distributed. *Pogonomyrmex* spp., harvester ants, are among the most abundant ants in the southern USA. Foragers depart from the nest on trails which are well defined and remarkably persistent over long periods of time. The trails lead to seed patches which are frequently quite stable. The trails of neighbouring colonies never overlap (Hölldobler and Lumsden 1980). Aphids, tended for honeydew by *Formica* spp., are a stable resource as the colonies can exist for the whole season at the same spot (Sundström 1993) and the trail system is used as a foraging strategy by many species of *Formica* (Rosengren 1971). The trail system provides a mechanism which reduces search or travel time by directly channelling foragers to a persistent resource (Traniello 1989). Insects represent temporally and spatially unstable, but occasionally very rich, clumped resources of protein (Sundström 1993) and foragers who lose their way from a trail are potentially able to find and exploit new food sources, such as prey or another aphid colony (Pasteels, Deneubourg and Goss 1987).

The extent to which ants are recruited to a new food source may depend on the stability of resources. For example work by Gordon, Rosengren and Sundström (1992) discuss the differences between the results of their study on forager allocation in *Formica polyctena* compared to work by Gordon (1991) on *Pogonomyrmex barbatus* (Smith, F.), a seed eating ant. Depleting foragers on a *F. polyctena* trail did not led to recruitment of additional foragers, whereas *P. barbatus* responds rapidly. One explanation for the rapid response of *P. barbatus* could be the ephemeral nature of their food sources, wind blown seeds. The food source is not continuously renewable and rapid recruitment is necessary to exploit new food sources as they are discovered.

Ants are also capable of changing their foraging strategy as food density increases or decreases. Work by Bernstein (1975) showed how *Veromessor pergandei* (Mayr), a seed eating ant which occurs in areas of generally low seed density uses an efficient method of group foraging whereby foragers from a colony search for food in the same direction, forming one long continuous column which often widens at the end. Each day the column rotates in the direction of increasing seed abundance, ensuring foragers are always in an area that has not been previously searched. During times of seed abundance, this breaks down and *V. pergandei* search and collect food independently from each other. This can be induced in a colony by supplying extra seeds.

The foraging behaviour of the *Formica rufa* group has been well studied in continental Europe (Cotti 1963) and the group provides an excellent illustration of the trunk trail system. The trails can show remarkable persistence. Rosengren (1971, p. 8) studied a *F. rufa* colony of two interconnected nests, which foraged the whole of an islet in Finland. The main routes of the foraging system changed little during the nine year study period. The main changes to routes were caused by the relocation of nest sites.

He also studied a *F. polyctena* nest for three years, during which time the seven main trails remained unchanged, apart from some minor rerouting. The only major change was the appearance of an eighth main trail in the last year of study. In both cases the trails were distinct and easy to observe. He also observed *F. polyctena* clearing their routes of vegetation. The trails did not always end in an aphid bearing tree and he speculated that these trails led to hunting grounds for insect prey. Experiments showed that foragers on particular routes showed a high degree of route fidelity, throughout the season (though weakest in May) and retained their fidelity over winter. Recruitment to new food sources was seen, but recruits were additional foragers rather than diverted foragers from other trails. The trunk trail system is obviously extremely successful in this environmentally stable environment. The aphids may be patchily distributed but they represent a spatially stable, constantly renewable resource during the season and reappear from year to year. The trees visited are not always the same from year to year, although intensely frequented trees tend to be the same (Rosengren 1977). Work by Dobrzańska (1958) on *F. rufa* showed high route fidelity, with marked ants returning to the same tree they were marked on each day for ten days observation. Recruitment to prey items was poor in ants with high route fidelity and very efficient in species with no defined routes such as *Formica sanguinea* Latreille.

The territoriality of polygynous *F. polyctena* nests was extensively studied by Mabelis (1979a) in the Netherlands. Wars between nests were very common. New nests were formed by splitting, thus neighbouring nests were generally of the same origin. The longer the nests are isolated from one another (decline of internest transport), the more aggressive the encounters between foragers from different nests. Changes in territory size occur mainly during wars in the spring. These wars were extremely aggressive with thousands of casualties a day and the boundaries between neighbouring nests were sharply defined. He felt there was good reasons to assume that the wars were related to food requirements. In the spring there is a shortage of protein rich food needed for developing larvae and as the need for food increases, the number of active foragers also increases, increasingly the probability of encounters with individuals from different nests. Thus, during the spring and summer each nest has its own territory, separated by a no-ant land between the foraging areas of populations. During the summer it was possible to incite a war, but the number of casualties and the duration were much lower than in the spring. During the autumn there was no aggression between ants of different colonies, territories of neighbouring colonies overlapped and they were observed sharing trees. He also found that territory size was important in nest survival, those with territories of less than 500 m^2 died off more often than those with territories greater than 500 m^2.

There are no studies, apart from this current one, in the UK on wood ants which show the territories of a number of colonies in the same detail and over several years as Mabelis (1979a).

Holt (1955) describes Scottish wood ant (*lugubris* or *aquilonia*) nests as often remaining in the same place for many years and associated with particular trees, utilising clearly defined tracks. Sudd (1983) investigated the distribution of foraging *Formica lugubris*

in relation to the distribution of *Cinara pini* (Linnaeus) and *Cinara pinea* (Mordwilko) on *Pinus sylvestris* L. Trees closest to the ant nests had two or three times as many workers as trees further away.

Skinner (1976) determined the size and shape of territories in *F. rufa* in a limestone woodland in northern England. Aggression tests were used to determine which nests workers originated from. He produced a map of the trails for seven nests for summer 1973 and spring 1974 which show distinct territories and non overlapping trails. He believed spring battles determined the boundaries of each nest's territory in the spring each year. The size of a territory in the summer of 1973 ranged from 272 m^2 to 1616 m^2, with 53 % of the total area occupied by *F. rufa*. Elton (1932) studied *F. rufa* in southern England. Trails to trees and shrubs, where *F. rufa* was found to be tending aphids, determined the size and shape of territories. Trails varied in length from 7 m to 73 m and there was no connection between trails from different nests. In contrast to Skinner (1976), *F. rufa* was not aggressive.

Elton (1932) found that trails to some oak trees were used in all three years of observation, whilst others changed in length and direction as workers invaded new territories or young trees grew up. Skinner (1980b) found the trail pattern for *F. rufa* in spring is more restricted than that of the summer. Skinner does not discuss details of which trees are used in both years, but it is clear from the maps that the patterns are similar between years and a large proportion of the trees were being foraged in both years. It should be noted that foraging on sycamore is important early in the season, superseded by oak and pine in the summer and autumn (Skinner 1980a) This would account for some of the differences between the maps. Adams (1991) mapped the trails of eleven *F. rufa* nests once in May 1989. Each trail ended in an oak tree and the trails from different nests never crossed. Between adjacent territories there was an ant free zone. A number of oak trees were felled during the study and the canopy twigs were found to be heavily infested with *L. roboris* eggs.

It is clear the distribution of aphid bearing trees is an important component of a *F. rufa* foraging area. The importance of trees in determining foraging behaviour was studied by Skinner (1980a). He investigated all the trees in one site on four occasions in the season and assessed the number of workers on them using a six point scale. There was a decline in the importance of sycamore as the season progressed, this being generally correlated with an increase in activity on oak and pine. This activity is related to the changing abundance of the honeydew producing aphids on these trees. Blanford (1994) compared the numbers of *F. rufa* ascending beech and oaks trees and found nearly twice as many ascend oak as beech, but no seasonal comparisons were made. Skinner (1980b) compared the number of each species of tree within 5 m radius of a nest to the number of each species of tree over the whole site. The results were not significant but there was a clear trend for nests to be close to sycamore, leading to the conclusion that nest establishment and survival is linked to the proximity of sycamore trees. Blanford (1994) investigated foraging by *F. rufa* in Burnham Beeches on oak and beech. The proportion of foraged to unforaged trees within a 20 m radius of ten nests showed that 50 % of beech were foraged and 85 % of oaks. Around nests where numbers of beech

predominated, oak was preferentially foraged; at sites where oak predominated there was no preference.

This study looks in detail at the number, species and frequency of foraging on trees within a number of *F. rufa* colonies. This will be an important contribution to the knowledge of foraging behaviour in *F. rufa*.

2.1.3 The effects of changes in food supply

Jensen (1978), in constructing an energy budget for *Formica pratensis*, showed the amount of production due to sexuals was very small in comparison to the production of new workers. MacKay (1985) showed that the proportion of assimilated energy incorporated into new biomass was relatively low and the allocation between workers and sexuals variable; *Pogonomyrmex montanus* MacKay allocated approximately equal amounts of energy in the production of workers and sexuals, whilst *Pogonomyrmex rugosus* Emery invested six times, and *Pogonomyrmex subnitidus* Emery ten times more energy in the production of workers as sexuals. It can be hypothesised that an increase in food supply would lead to an increase in sexual production, as more energy would be available to be channelled into reproductives and a number of studies have investigated this. A comprehensive study by Deslippe and Savolainen (1994) showed that fed colonies of *Formica podzolica* Francoeur produced more alatae than control colonies, as did fed colonies of *V. pergandei* and *P. californicus* (Ryti and Case 1988). MacKay (1985) manipulated the food supply of the harvester ant, *P. montanus*, by removing the food collected by returning foragers and substituting it with more or less food. He found that food supplemented colonies produced more males than control or food deprived colonies. He found that food deprived colonies produced more females or equal numbers of males and females. He concluded that in "good" years, when food was abundant, more energy could be invested in the production of males. Backus and Herbers (1992) found protein supplemented colonies of *Leptothorax longispinosus* Roger also showed increased male production.

2.1.4 Energy flow through ant populations

The dominance of ants in terms of numbers and biomass in many ecosystems makes them important contributors to energy flow in ecosystems (Nielsen 1972; Horn-Mrozowska 1976). The nests of the leafcutter ants are particularly important in terms of nutrient cycling and energy flow in tropical rain forests (Hölldobler and Wilson 1990, p. 2). The flow of 13 elements through *Atta colombica* Guerin colonies is 16 to 98 times the flow in undisturbed leaf litter. Annual energy flow through the nests was eleven times the energy flow away from the nest (Gotwald 1986).

The International Biological Programme (IBP), whose subject was defined as *"The Biological Basis of Productivity and Human Welfare"*, gave some groups of organisms with obvious importance in ecosystems special emphasis, including social insects. This stimulated the study of ants and termites from the production point of view and has provided much comparative data (Brian 1978). Studying the energetics of ants is

difficult and time consuming, and their social nature often makes the population sizes involved very large (Nielsen and Josens 1978). Measurements in the field are always imprecise; measurements in the laboratory, whilst more accurate, are made in an artificial environment and there are doubts that the organism is behaving normally (Peakin and Josens 1978). A combination of field and laboratory data provides an estimate of energy flow. The overall energy budget of an ant colony varies greatly from species to species and even within a species. Energetic costs vary because of intrinsic factors, such as the numbers of eggs, larvae, pupae, workers, males and queens, the stage of brood and reproductive development and activity levels of the colony and extrinsic factors, such as temperature and humidity (Peakin and Josens 1978).

Measurements of food consumption by ant colonies can provide a check on the estimates for gross production and respiration. Food intake is related to brood development and reproduction and is often seasonal for both extrinsic and intrinsic reasons (Stradling 1978). Ants show extremes of dietary specialisation and generalisation, but most species are omnivorous, combining predation, scavenging and the collection of plant material. There is a tendency for more selective species to achieve higher assimilation-to-consumption ratios because their food contains more nourishment and they are better adapted to digest it. However, even generalists are selective of foods with high protein or carbohydrate contents (Stradling 1978).

There are many difficulties in obtaining comprehensive, detailed, quantitative data of food intake by omnivorous ant colonies. Samples of burdens removed from foragers are weighed and this information must be used in conjunction with information on the daily and seasonal foraging rhythms in order to extrapolate to an estimate of yearly intake. The inherent weakness in many estimates is the short duration of observations. Food intake can vary considerably in time and between trails of the same nest (Stradling 1978). The inherent limitations of human observation can in part be overcome using semi-automatic collecting devices. Chauvin (1966) was the first to construct and use such a device to aid in the collection of returning foragers to a nest in order to determine activity on a daily and seasonal basis as well as determine seasonal change in honeydew and prey collection. Variations on this device have been used by a number of authors, for example Finnegan (1969), Horstmann (1970, 1972), Skinner (1980a) and Adams (1991).

There have been many studies on the food consumption of the *F. rufa* group (Økland 1930; Wellenstein 1952; Holt 1955; Gößwald 1958; Galle 1976; Jensen 1978; Skinner 1980a; Adams 1991). Some studies have tried to quantify the number and type of insect prey taken, to assess their potential as biological control agents. Other studies have tried to estimate the amount of sap removed by the aphids, which is collected by ants as honeydew, due to the possible detrimental effect this might have on tree growth (Adlung 1966).

Skinner (1980a) collected foragers returning to the nest using a semi-automatic collecting device. Seasonal differences in material brought back to the nest were seen. There was a peak in the collection of plant material early in the season, which is used

for nest repair after damage in the winter. Aphids (mainly *Drepanosiphum platanoidis* (Schrank)), as prey items, also peaked early in the year which corresponded with their peak on abundance on the trees. Flies, especially *Bibio* spp., also peaked in the spring. Caterpillars, mainly *Operophtera brumata* Linnaeus, peaked in May and by the end of June no longer formed a significant part of the diet. Honeydew was the most important dietary constituent. The number of workers carrying honeydew always exceeded the number carrying solid food or nest materials. Honeydew is more important in terms of biomass, peaking in May. Adams (1991, p. 139) also investigated seasonal differences in material brought back to the nest. Numbers of workers returning with honeydew was consistently high between mid May and the end of September for 1989 and 1990. There was a peak in the intake of caterpillars in mid May in 1989 and 1990. In contrast to the finding s of Skinner (1980a), the peak in collection of plant material was June to August.

2.2 Effect of ants on other invertebrates

Ants are among the most numerous, widespread and efficient predators of all arthropods (Finnegan 1974) and for centuries it has been noted that foraging ants influence the insect fauna of plants. Ancient Chinese fruit growers transplanted nests of *Oecophylla smaragdina* Fabricius to eat pests of their citrus trees, a practice which still goes on today (Gotwald 1986). Ants can be important biological control agents. For example, *Formica neoclara* (Emery) has been shown to reduce pear psylla (*Cacopsylla pyricola* (Förster)) population densities, an important pest of pear trees (Paulson and Akre 1992). In contrast, ants can also be important pest species. For example, the pharaoh's ant (*Monomorium pharaonis* (Linnaeus)) has become distributed throughout the world by international trade. In temperate regions, infestations are confined to permanently heated buildings such as hospitals (Edwards and Abraham 1990). The interactions between ants and other invertebrates can take place in the tree canopy or on the ground.

The army ants are one of the most well studied ant groups. *Eciton* spp. are all known for their dramatic and conspicuous foraging (Gotwald 1995). *Eciton burchelli* Westwood is a generalist predator occurring in South America. It exhibits a functional cycle of alternating statary and nomadic phases related to the synchronized development of the brood. A colony may contain up to two million workers. During its nomadic phase it raids areas, clearing them completely of invertebrates and any vertebrates which cannot evade their attack (Gotwald 1995).

O. longinoda is strongly predaceous and, using its cooperative ability, captures a wide range of large insect prey that ventures into its territory. It is highly aggressive to many other ant species, as well as workers from a different colony of its own species. Only a very few ant species are found to coexist with *O. longinoda* on the same tree (Hölldobler and Wilson 1990, p. 401).

Introduced species of ants often have profound effects on the native ant fauna and other invertebrates. The Argentine ant, *Linepithema* (=*Iridomyrmex*) *humile* (Mayr) has

spread throughout the world as a result of trade movements and, when it has found favourable conditions, has replaced much of the native ant fauna (Majer 1994). A study by Cammell, Way and Paiva (1996) showed that the native diverse ant fauna (43 species recorded) in arboreal habitats in Portugal was reduced to just three species in the presence of *L. humile*, which made up 99 % of the individuals recorded.

Grant and Moran (1986) studied the effects of foraging ants on arboreal insect herbivores on savannah trees in South Africa. There were 26 species of ants, the dominant ones being all honeydew dependent but all were at least partly predatory. Some trees were banded to exclude the ants and the insect communities and leaf damage were compared on these trees and control trees. Foraging by ants did not affect the composition of insect community compared to banded trees, except for the presence of the ants and Homoptera. There were significantly more Homoptera on control trees. Leaf damage on trees where ants had been excluded was slightly greater than on control trees.

Ito and Higashi (1991) showed the presence of *Formica yessensis* Forel changes the insect community on oak by decreasing the numbers of leaf feeding insects, but increases the numbers of the aphid *Tuberculalatus quercicola* (Matsumura).

There are many studies on the *Formica rufa* group (see reviews by Cotti 1963 and Adlung 1966) because of their potential use of biological control agents of forest pests. The subject is highly controversial, as there are advantages and disadvantages to ant foraging in the tree canopy (Adlung 1966). Wood ants are generalist predators and may prey on as many beneficial insects as harmful ones. In addition their encouragement of sap sucking Homoptera may be detrimental to tree growth. Niemelä and Laine (1986) reported the existence of green islands, with a radius of 17 to 22 m, around wood ant nests in otherwise damaged birch forests in Finland. Adlung (1966), summarising the European research on wood ants as potential biological control agents, found only one clear case where wood ants were of value in controlling a forest pest.

There are a number of studies in the UK on the effects of predation by *F. rufa* on the herbivore community structure in the tree canopy. Wood ants do not prey equally amongst the species available, the consequence of which is often a profound change in the community structure between wood ant foraged and unforaged trees (Whittaker 1991, p. 72). Skinner and Whittaker (1981) showed how predation by *F. rufa* significantly reduced the numbers of the untended aphid *D. platanoidis*, whereas the numbers of the tended aphid, *Periphyllus testudinaceus* Fernie, were significantly increased. The numbers of defoliators were significantly decreased in the presence of *F. rufa* and there was some evidence that this led to a significant decrease in the leaf area consumed by defoliators. Follow up work by Whittaker and Warrington (1985) and Warrington and Whittaker (1985a, b) showed that leaf loss due to Lepidoptera feeding and stippling by Typhlocybinae was three to seven times as high on unforaged trees as on foraged trees. Phloem sap loss was two to three times greater on unforaged trees as on foraged trees. Work by Fowler and MacGarvin (1985) on *F. lugubris* on birch showed that the presence of the ants depressed herbivore species richness, changing the

structure of the insect community in favour of those species that live internally, have some other form of physical protection or are ant tended. A study by Mahdi and Whittaker (1993) who studied the effect of *F. rufa* on the insect community on birch came to a similar conclusion. Blanford (1994) compared the insect communities of oak and beech foraged by *F. rufa* in Burnham Beeches with the insect communities on unforaged oak and beech. The number of families recorded falls in the presence of *F. rufa* but not significantly so. However, the detailed effect on communities showed some variation. On oak, the presence of *F. rufa* reduces the numbers of Callaphididae and Cicadellidae, but the numbers of Lachnidae rise. On beech, foraging by *F. rufa* causes the numbers of Lachnidae to rise (none were found on unforaged beech).

The effects of ants on other ground living invertebrates is very variable. Pętal and Breymeyer (1969) found that spiders made up between 11 and 38 % of the food of *Myrmica laevinodis* Nylander, *Myrmica ruginodis* Nylander and *Myrmica scabrinodis* Nylander. The peak in the number of spiders caught was in May, June and July; the density of the spider population was inversely proportional to the number of spiders taken by *Myrmica* spp.

There have been a number of studies using pitfall trapping to assess the effect of the presence of ants on the ground floor fauna (van der Aart and de Wit 1971; Sudd and Lodhi 1981; Brüning 1991). The studies on *Formica* spp. present a mixed picture. A study by Brüning (1991) estimated that 4.6 % of the prey items brought back to the nest by *F. polyctena* were spiders. Pitfall trapping within and outside a *F. polyctena* foraging area showed that the presence of the ants did not reduce the abundance or composition of spiders, as was expected. Work by van der Aart and de Wit (1971) showed no significant difference between the composition of the spider community or in the total number of spiders caught in pitfall traps between a habitat where *F. rufa* was abundant and a comparable habitat where it was absent. In contrast, work by Cherix and Bourne (1980) showed the opposite. They estimated that over 5 % of the invertebrates brought back to the nest by *F. lugubris* were Arachnida. Pitfall trapping revealed the diversity of spiders caught outside the foraging area of *F. lugubris* was higher than within. In particular the larger spiders were more numerous outside the foraging area. There were also seasonal differences. The most frequently caught linyphiid spiders in pitfall traps were most numerous in the late autumn and early winter when *F. lugubris* was less active. They were therefore rarely captured by the ants as prey.

Breymeyer (1966) pitfall trapped for two consecutive years. One third of the arthropods caught were spiders, but they were not as numerous in the second year. Day and night trapping revealed that, overall, spiders were active at day and night, but there were differences between families. For example, the Agelenidae were nocturnal and the Salticidae were only active in the day. The Opiliones and larger Carabidae were nocturnal, whilst the ants, *F. rufa* among them, were mainly active during the day. The large Araneida and Carabidae also showed distinct seasonal variation in numbers, with the Araneida most abundant during spring and the Carabidae in August. This work reveals a complex picture of daily and seasonal partitioning of the activity and

abundance of similar sized members of a forest invertebrate community which Breymeyer concludes reduces competition amongst them. The work also showed that in a meadow the presence of ants decrease the number of spiders found and, where ants are few, the density of spiders rises. Work by Gridina (1990) showed how, overall, the presence of *F. polyctena* affected the abundance of Arachnida. However, this effect was spatially structured. *F. polyctena* were most abundant on trails, but in between the lower density of *F. polyctena* allowed the coexistence of other potentially competitive predatory species such as Arachnida and Carabidae. The study also showed seasonal partitioning of activity between potential competitors similar to that of Breymeyer (1966).

Sudd and Lodhi (1981) pitfall trapped in an area within 40 m of nests of *F. lugubris* and an area 90 m from nests, during winter (November to mid May) and summer (mid May to December). The analysis of the abundance of each species of Araneae and Opiliones caught showed great variation between species and for the same species from year to year. There was some evidence of a reduction in catches of Araneae and Coleoptera in areas near ant nests. They found no evidence that the presence of *F. lugubris* reduced the diversity of the invertebrate community. Hammond (1992) pitfall trapped in Burnham Beeches in an area where *F. rufa* was present and an area where it was not. The presence of the ants significantly reduced the numbers of medium to large predators such as Chilopoda, Opiliones and Coleoptera. Looking in more detail at the Coleoptera, *Zyras humeralis* (Gravenhorst), an obligate myrmecophile, was absent from the ant free area. The two large Coleoptera predators, *Abax parallelepipedus* (Piller and Mitterpacher) and *Pterostichus madidus* (Fabricius) were both significantly more abundant where *F. rufa* was not present.

Sudd and Lodhi (1981) point out that some studies are short in duration, perhaps only covering one season of the year, with no replication between years. For example the study by van der Aart and de Wit (1971) was for thirteen weeks and Hammond (1992) trapped for only one week in August and one week in September; this must make conclusions drawn from the work open to question. Their own study, where collections were made every two weeks for two consecutive years revealed great variation for the same species between different years and for the species composition for the community overall.

The current study presents pitfall trap data spanning three consecutive years in *F. rufa* present and *F. rufa* absent areas.

2.3 Spatial and temporal structuring of ecosystems and food webs

The experimental results from the study of *F. rufa* in Burnham Beeches, whilst interesting and informative in their own right, can also be used to illustrate and inform some components of a highly theoretical framework whilst at an early stage of its development. As Perry and Pianka (1997, p. 362) point out "*It appears unwise to build more layers of new theory upon a largely untested foundation of older theory*". The

Ecosystem Trophic Module (ETM) (Cousins 1990), is a theoretical concept which takes stability in space to its limit. The idea itself, which will be described in section 2.3.1, arose from Cousins' dissatisfaction with classical definitions of ecosystems (Tansley 1935; Lindeman 1942), which do not indicate how ecosystems should be delimited (Cousins 1990).

Ecology could not be described as a unified discipline The disunity arises, in part, from the lack of a unifying framework (McIntosh 1985; Allen and Hoekstra 1992; Pahl-Wostl 1995). It is common to think of the universe in terms of a hierarchy of natural entities which includes molecules, cells, organisms and the biosphere. Many ecologists feel the study of ecology is complete at the level of the organism (MacMahon *et al.* 1978, p. 700), but others would like there to be a naturally occurring entity at a higher level than that and the ecosystem is often considered the basic unit in ecology (Evans 1956). However, the existence of an ecosystem or community as an objective entity is a controversial subject (Simberloff 1980; Ghiselin 1987; Ricklefs 1987). Ecosystems, assuming they exist, are not perceptible in the same way that organisms are and definitions are not universally agreed upon. This has lead to two fundamentally different views about what ecosystems are and how they should be studied: the ecosystem as the sum of its parts (organisms) such that the whole system may be understood by understanding its parts, and the ecosystem as more than the sum of its parts such that understanding its parts does not lead to a complete understanding of the whole (McIntosh 1980, p. 240).

If there is no commitment to the ecosystem as an objective unit (Gleason 1926); boundaries can be placed wherever convenient. This is illustrated by the classical definition of an ecosystem by Lindeman (1942, p. 400) as "*the system composed of physical-chemical-biological processes active within a space-time unit of any magnitude i.e., the biotic community* plus *its abiotic environment*" [emphasis in original]. In this case boundaries are usually made along zones of minimal interaction or exchange, although all processes may not map over the same volume or space. Studying different sets of interactions leads to different boundaries being defined (Reiners 1986).

If, however, ecosystems are naturally occurring entities then their boundaries are formed by the interactions of entities in the next level down (organisms) and the boundary emerges as part of the new entity. The important point is that naturally occurring boundaries are set *a priori* and a study of the whole system means that the boundaries the ecologist uses should coincide with the naturally occurring boundary. If ecosystems had naturally occurring boundaries then it is of fundamental importance to ecology to identify their existence. Such an object would be the elementary particle akin to the atom, the cell or the organism (Patten 1982, p. 179). The practical implications would be far reaching. Experiments would be bounded not where convenient but coincident with the natural boundary of the ecosystem. Such standardisation would make comparisons between experiments in different ecosystems possible. However, the fact that there is no universal agreement on what constitutes an ecosystem boundary belies the difficulty of actually recognising one when you find it (not withstanding the fact that

they may not exist at all). Other related areas of ecology would also be affected. The lack of methodological standards is a common complaint in, for example, food webs (Paine 1988; Polis 1991; Pahl-Wostl 1993). The discovery of natural boundaries in ecosystems would give food web or community ecologists a spatial scale at which to work.

The first ecologist to publish a diagram of a food web seems to have been Shelford in 1913 (Lawton 1989), although it was Elton (1927) who gave food web ecology most of its essential ideas. A food web diagram depicts which species trophically interact in a community i.e. who eats whom. Published food webs rarely contain important information such as the frequency and intensity of the feeding (Lawton 1989; Paine 1988; Polis 1991) and are, therefore, "*caricatures of nature*" (Pimm 1982). A diagram with arrows from prey to predator appears to give equal weight to the interaction, despite the fact one prey species might be the main dietary item and another might be of little importance. Food webs are a qualitative guide to the observed feeding relationships between organisms and are incomplete (Paine 1988). Yet the publication of collections of food webs by Briand and Cohen (1987) and the computerised data base of 213 food webs (Cohen 1989) lead to a growth industry in analysing the data for patterns (Briand and Cohen 1987; Cohen 1989; Schoenly and Cohen 1991) and sweeping statements such as the "*five "laws" of webs*" (Cohen 1989). Despite comments like "*It is embarrassingly easy to list ways in which existing empirical data on food webs could be improved*" (Lawton 1989, p. 71), the theorists paid little attention to the quality of the data they were analysing or whether they were comparing like with like. Empiricists were quick to criticise. Polis (1991) was highly critical of the analysis of food webs and specifically set out to analyse the results of his studies on the food web of a sand community in the Coachella Desert for the patterns claimed by the theorists Pimm and Rice (1987) to occur in real food webs. He saw little correspondence between the two and was vehement in his criticism:

> "*Observed patterns are quite different from those assembled from published webs. I argue that most catalogued webs are overly simplified and poorly represent actual communities. Consequently, the practice of abstracting empirical regularities yields an inaccurate and artifactual view of trophic interactions within communities.*" (Polis 1991, p. 124).

The lack of methodological standards is a major problem to progress (Paine 1988; Polis 1991; Pahl-Wostl 1993). In recent years, however, there have been moves to put aside disagreements and concentrate on getting a consensus on a way forward. Cohen *et al.* (1993) makes steps towards such a consensus. The list of 23 coauthors (which must be something of a record) makes interesting reading in itself, with its mixture of theorists such as Pimm and empiricists such as Polis. It is to hoped that cooperation between theorists and empiricists will lead to major steps forward in the future. Pahl-Wostl (1993, p. 416) identified the main points necessary to standardise field research:

1. Report of the sample size, spatial and temporal scale.
2. Rules for defining assemblages and aggregations.
3. Rules for incorporating a species and/or link or not.

The importance of space and time is quite clear, all ecological interactions are played out in a spatial and temporal arena. Organisms in a community experience the world at vastly different spatial and temporal scales (Pahl-Wostl 1993; Holt 1996). Attempts have been made to formally incorporate spatial and temporal scales into ecosystem and food web description (Pahl-Wostl 1993; Holt 1996). Both Pahl-Wostl (1993) and Holt (1996) are concerned with the detailed description of the structure of the food web and suggest that the overall spatial and temporal scale could be defined by a unit such as the ETM.

2.3.1 The Ecosystem Trophic Module

A theoretical attempt has been made to identify a naturally occurring bounded ecosystem entity (Cousins 1990). Cousins focused on the importance of using ecological processes to produce an ecosystem entity. In this case, the chosen ecological process was feeding relationships. Unlike conventional definitions of ecosystems or communities, this ecosystem entity has a specific size and location and the boundaries are not set by the observer but emerge as a property of the formation of the entity.

The Ecosystem Trophic Module (ETM) was formally defined by Cousins (1990, p. 272) as:

> *"... the food web of a social group of the top predator species of a location. ... This entity has a given size, the foraging area of the social group. ... I define top predator as that organism which can eat (not parasitise) the largest prey organism."*

Viewing ecology in terms of energy flow through feeding relationships is the basis of this definition. The top predator is the peak of the pyramid of numbers (Elton 1927), the ultimate product of the ecosystem. The boundary of the foraging area is set by the energy needs of the top predator social group and is the greatest area over which energy flows through the system. Little of the incident energy from sunlight will reach the top predator but the foraging area provides the direction of flow of energy through feeding relationships (Cousins 1996). Power (*pers. comm.* to Cousins, cited in Cousins 1996, p. 249) described the ETM as "*a photon shed, a basin of attraction for the movement of chemically fixed energy originating in solar radiation, analogous to the movement of water on a watershed*"[1] (Figure 2.1).

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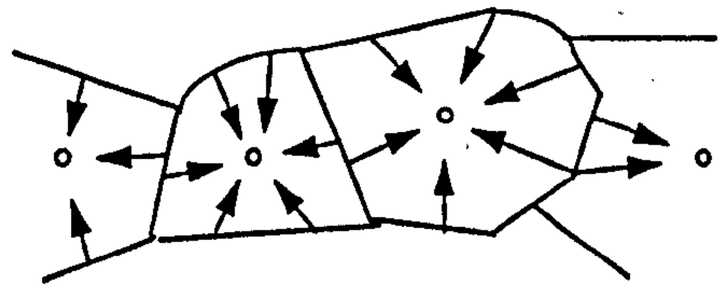
[1] There is a difference in the UK and US definitions of the word *watershed*. In UK usage, a watershed is the divide separating one catchment from another. In US usage, it is a collecting area into which water drains (i.e. what in the UK is called a catchment) (Allaby 1994). Power is using the US meaning.

Figure 2.1: The boundaries of an ETM formed by the overall paths of energy flow from incident solar radiation to the social group of the top predator. Reproduced from Cousins (1993, p. 78).

O = Centre of range of top predator social group. Arrows indicate the direction of energy flow.



The important (and radical) step is the suggestion that the foraging area of the top predator equates with the boundary of an ecosystem entity formed by the feeding relationships between organisms. Cousins (*pers. comm.*) suggests that ETMs as ecosystem entities are likely to exist as weak structures.

The advantages of such a definition are that it is a true ecological object since its boundaries are formed by an ecological interaction between organisms, feeding; it would allow comparisons between different ecosystems since all ecosystems have a top predator and it provides the ecologist with somewhere to draw the boundary. However, the framework has not been significantly developed beyond its initial presentation and makes no specific predictions. It also has a number of problems, the most fundamental of which is whether an ETM really is an ecological entity.

As will be seen, the work done on investigating the foraging area of *F. rufa* and the effect that it has on other invertebrates provides good data for testing the concept of ETMs. There are reasons (stated below) for believing that ants such as *F. rufa* should show any "ETM effect" more highly than most top predators, and therefore this study provides a relatively easy way of assessing the worth of the idea.

The presentation of ETMs in terms of top predators could lead to the erroneous conclusion that it is a top-down approach. It must be remembered that Cousins (1990) is not suggesting the top predator is creating the structure. The ecosystem structure is created by energy flow in the form of feeding relationships, starting with producers and is, therefore, a bottom-up approach. Therefore, the ultimate product of an ecosystem, the pinnacle of the pyramid of numbers (Elton 1927), is its top predator, and therefore the ecosystem is spatially delimited by the foraging area of the top predator. The suggestion is that the upwards energy flow creates a structure, the boundary of which is the foraging area of the top predator because this is the largest object created by the energy flow.

The theory is therefore an energetic approach, and this gives it the necessary generality to apply to all ecosystems. Energy is a general property of the universe, so this makes the framework generally applicable. Indeed, from the point of view of this thesis, it is

important to note that there is no reason to believe that the hypothesised mechanism for creating structure only applies at the level of top predators. Presumably the foraging area of all predators will show a similar structuring for the same reasons. Though the structure at the level of the top predator may be the clearest structure, it would seem only reasonable to assume that sub-structures corresponding to the foraging area of lower level predators would also be formed (an analogy would be the existence of organs between the cell and the organism levels). This is similar to the idea of compartmentalization in food webs (Pimm 1982), although Pimm and Lawton (1980) showed there was no evidence to indicate that food webs formed compartments within habitats. In contrast, Berryman (1993) maintains that in some instances ecosystems are structured into small, tightly interacting subsystems i.e. local food webs composed of fairly specific relationships which interact weakly with other similar subsystems. His reasoning comes mainly from biological control of pests where the population of the pest species is determined by a single factor, the abundance of its predators.

Cousins (1990, 1993, 1996) makes no detailed predictions regarding the nature of the hypothesised structure. Cousins (1993) suggests that the distribution of organisms should represent the ecosystem structure. This seems reasonable because interactions between organisms depend on their relative locations. Since the structure is hypothesised to extend over the foraging area of the top predator, it can be further hypothesised that the distribution of organisms should correlate with the structure of the foraging area. Otherwise, even if some structuring was found, it would not be the structuring that the ETM hypothesis requires.

From an experimental point of view, this necessity makes the choice of ants a good one. In the case of most predators, the foraging area is a composite of the predator's spatial positions through time. However, in the case of a social insect such as ants, the foraging area is the extent over which the ants are foraging at any instant, and the density of the foragers can be said to provide a measure of the structure of the foraging area. Thus if a structure corresponding to the foraging area of a predator did exist, then it would be expected to show up much more strongly in the case of ants than in the case of single-organism predators.

It should also be noted that, although not a top predator by the definition used in Cousins (1990), *F. rufa* it is a keystone predator in Burnham Beeches, and is rarely preyed upon by other organisms, the exceptions being the green woodpecker (*Picus viridis* Linnaeus) and a myrmecophilous beetle (*Z. humeralis*). Thus to a great extent, *F. rufa* represents the end point of the energy flow through its foraging area, and so the hypothesised ETM mechanism should apply to it. In addition, ants share many characteristics with carnivorous vertebrates (Hölldobler and Wilson 1990, p. 395). These are listed in section 7.4.

The work carried out in this thesis allows an attempt to be made to discover whether a structure such as the ETM exists. Chapter four determines the extent of a number of *F. rufa* colonies and shows how they vary through time. The stability of the foraging area has implications for the use of the ETM as a spatially bounded object. Chapter five

investigates the energy flow through a *F. rufa* foraging area. Chapter six attempts to see whether there is a correlation between the distribution of *F. rufa* and the distribution of other ground living invertebrates which might provide some evidence for the existence of a structure such as an ETM.

Chapter 3: Introduction to the experimental system

3.1 Introduction

Formica rufa was the chosen subject for the experimental work and section 3.1.1 describes its basic biology. The chosen study area, Burnham Beeches NNR and SSSI, is described and the study sites within Burnham Beeches are described in detail. Location maps of the trees and nests within each study site were constructed. A nest activity survey for nests within the study sites was carried out in 1994, 1995 and 1996 and an analysis of the distribution of trees around nests is presented.

3.1.1 General biology of Formica rufa *Linnaeus*

Formica rufa (Figure3.1 to Figure 3.3)[1] belongs to the family Formicidae, which contains about 15,000 known species. All members are social with wingless workers (sexually immature females) and winged sexual forms, although the queens lose their wings soon after mating. Colonies may be monogynous (single queen) or polygynous (multiple queens). The Formicidae have a varied omnivorous diet with aphid honeydew often being an important dietary constituent (Chinery 1986).

F. rufa belongs to a taxonomically difficult species group. Species are separated on the basis of the location of hairs on the head and thorax. All of the group are predaceous and aphidicolous (Collingwood 1979, p. 141). Six species of the *F. rufa* group can be found in Britain. *F. rufa sensu stricta* is a very distinctive bicoloured red and brown/black ant which is locally common in southern England and Wales. It is an aggressive species with powerful jaws that squirts formic acid. It is the largest British ant: workers vary in length from 4.5 mm to 9.0 mm; queens from 9.5 mm to 11.0 mm and males from 9.0 mm to 11.0 mm (Collingwood 1979, p.141).

The *F. rufa* group has been extensively studied, particularly in continental Europe. A bibliography by Cotti (1963) cites over 400 references. The *rufa* group has particular importance in forestry where it may be an important predator of arthropods. However, since both harmful and beneficial insects are taken as prey, there has been much debate as to the value of the *rufa* group in control of forestry pests (Adlung 1966).

F. rufa builds large hill nests (Figure 3.4), up to 1 m high and 2 m in diameter (Brian 1983, p. 96; Morley 1953, p. 72), of leaves and twigs with additional chambers excavated beneath them in the soil or in the wood of tree stumps (Skinner 1976, p. 7). Nests may be isolated or in small groups. On sunny days in the winter months the colony forms tight clusters of individual workers, sometimes including queens, on the top of the nest (Collingwood 1979, p. 143; *pers. obs.*; Figure 3.5).

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[1] Figure 3.1 to Figure 3.3 are reproduced from original drawings, with the permission of Derek Harvey.

Figure 3.1: *Formica rufa* worker. Magnification x10

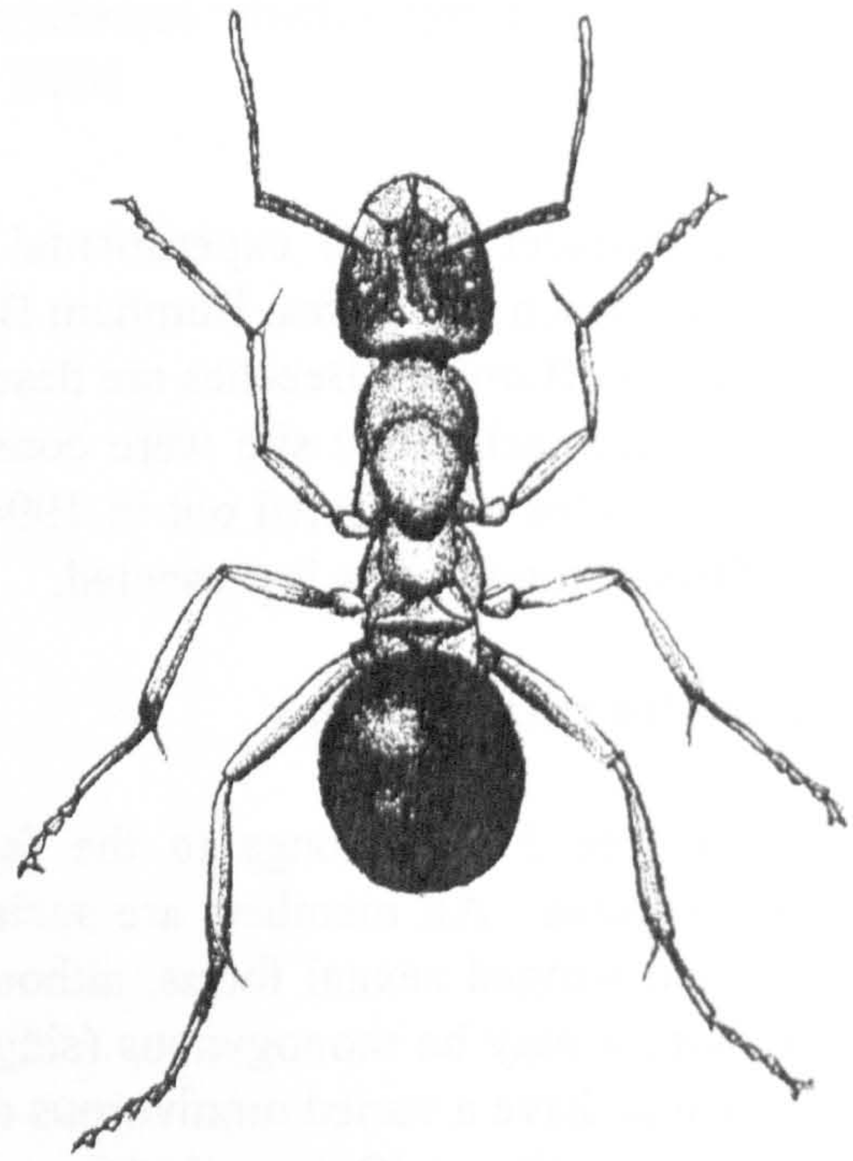


Figure 3.2: *Formica rufa* alate queen. Magnification x8

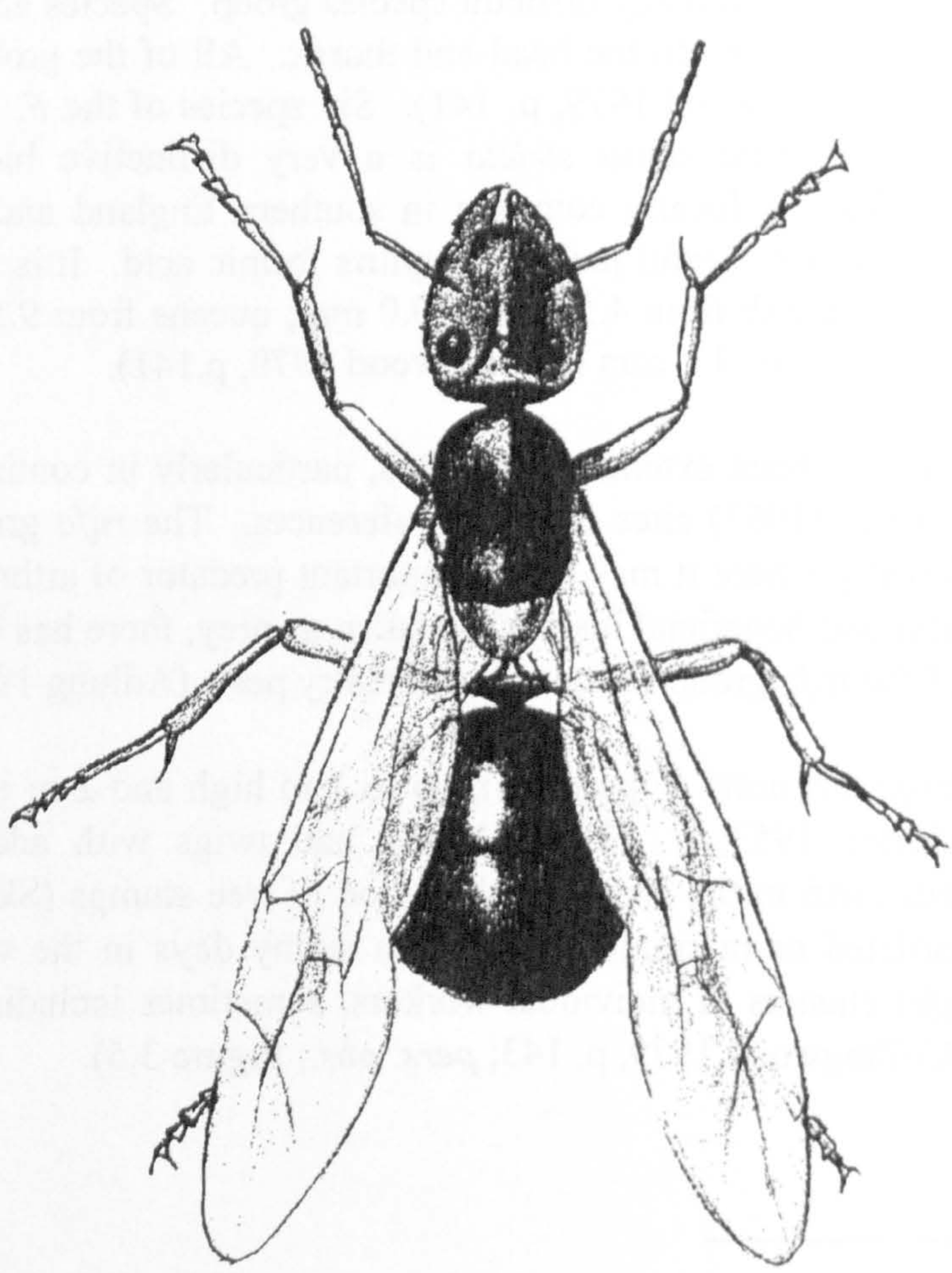


Figure 3.3: *Formica rufa* alate male. Magnification x8

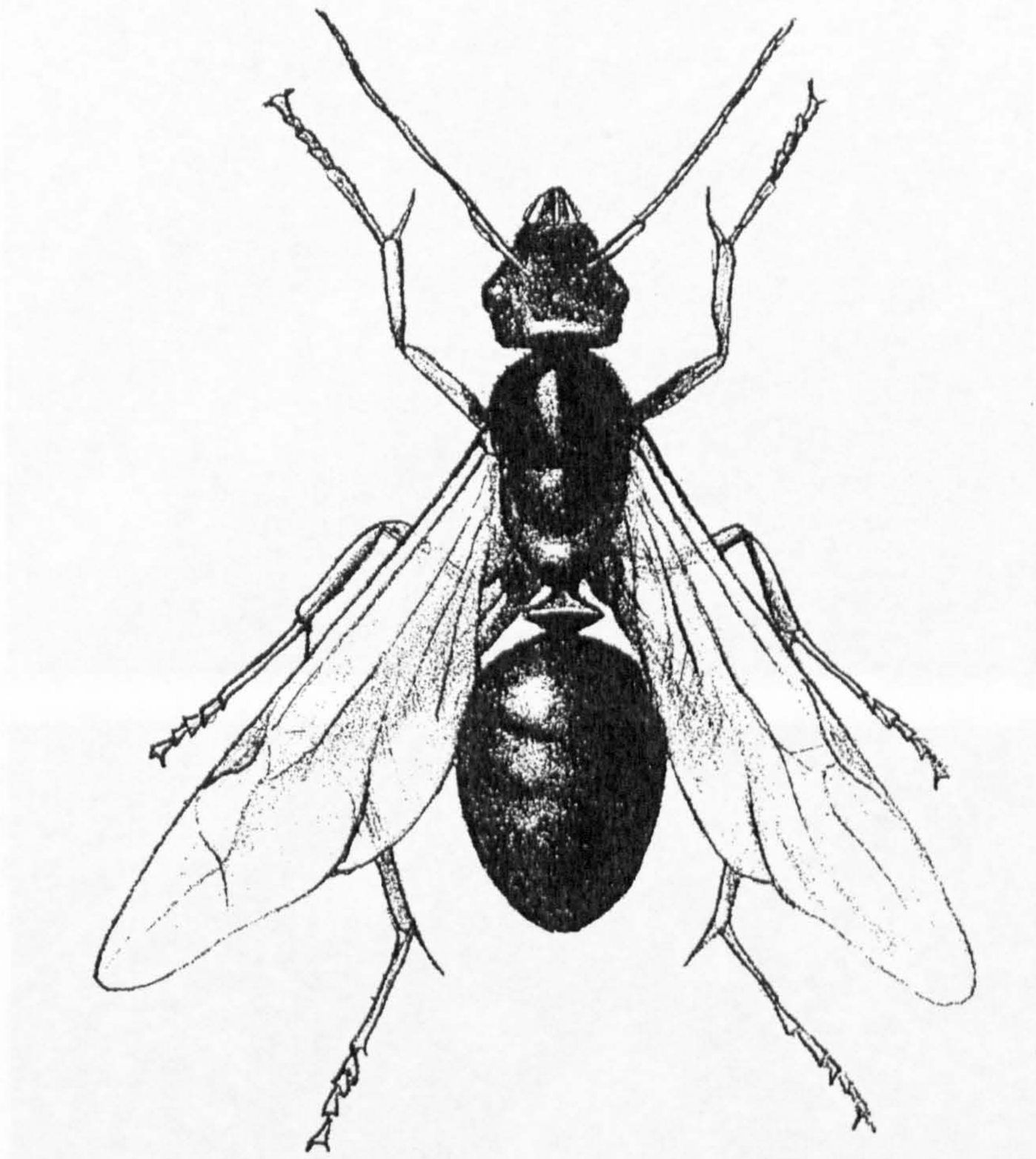


Figure 3.4: *Formica rufa* nest

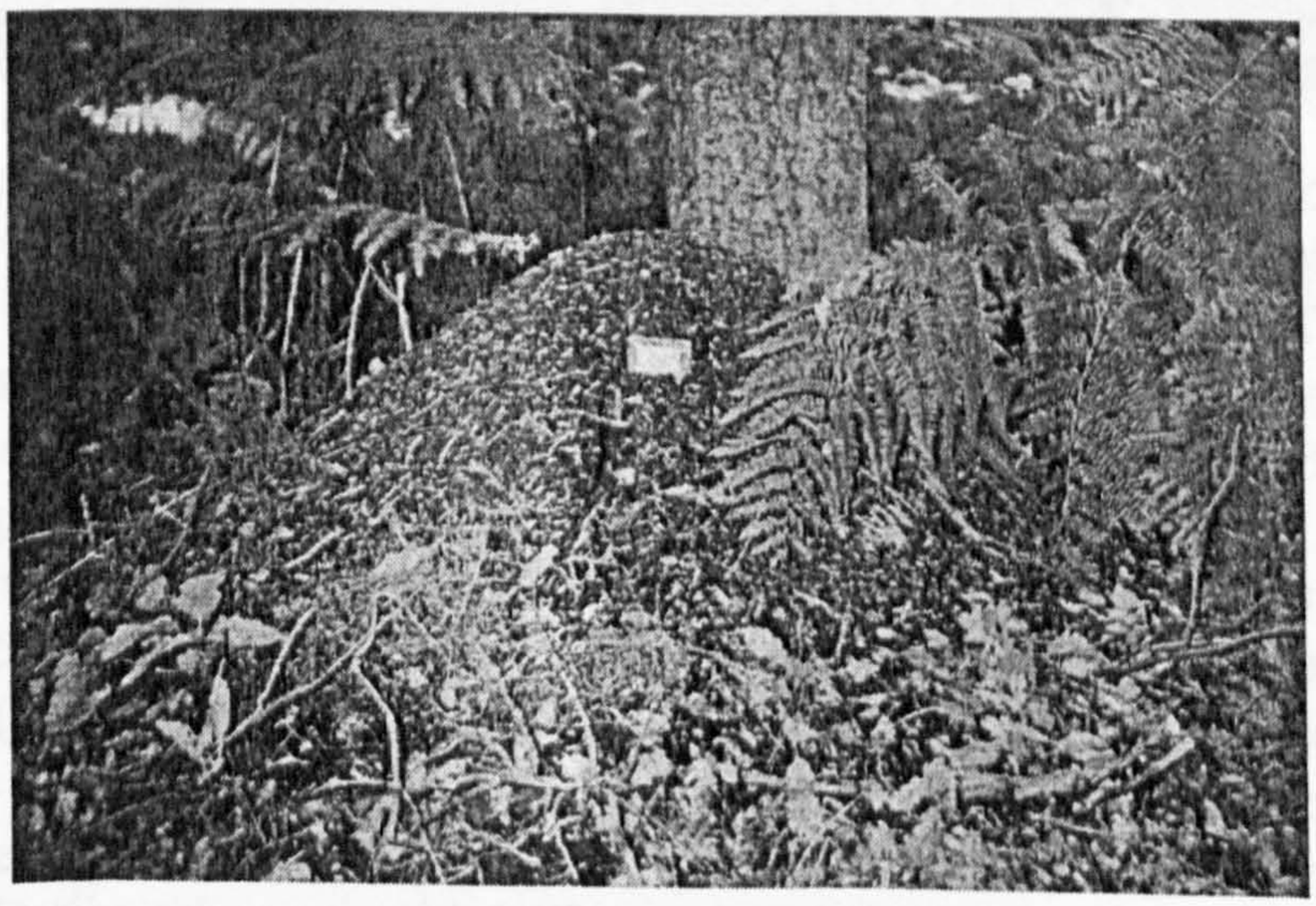
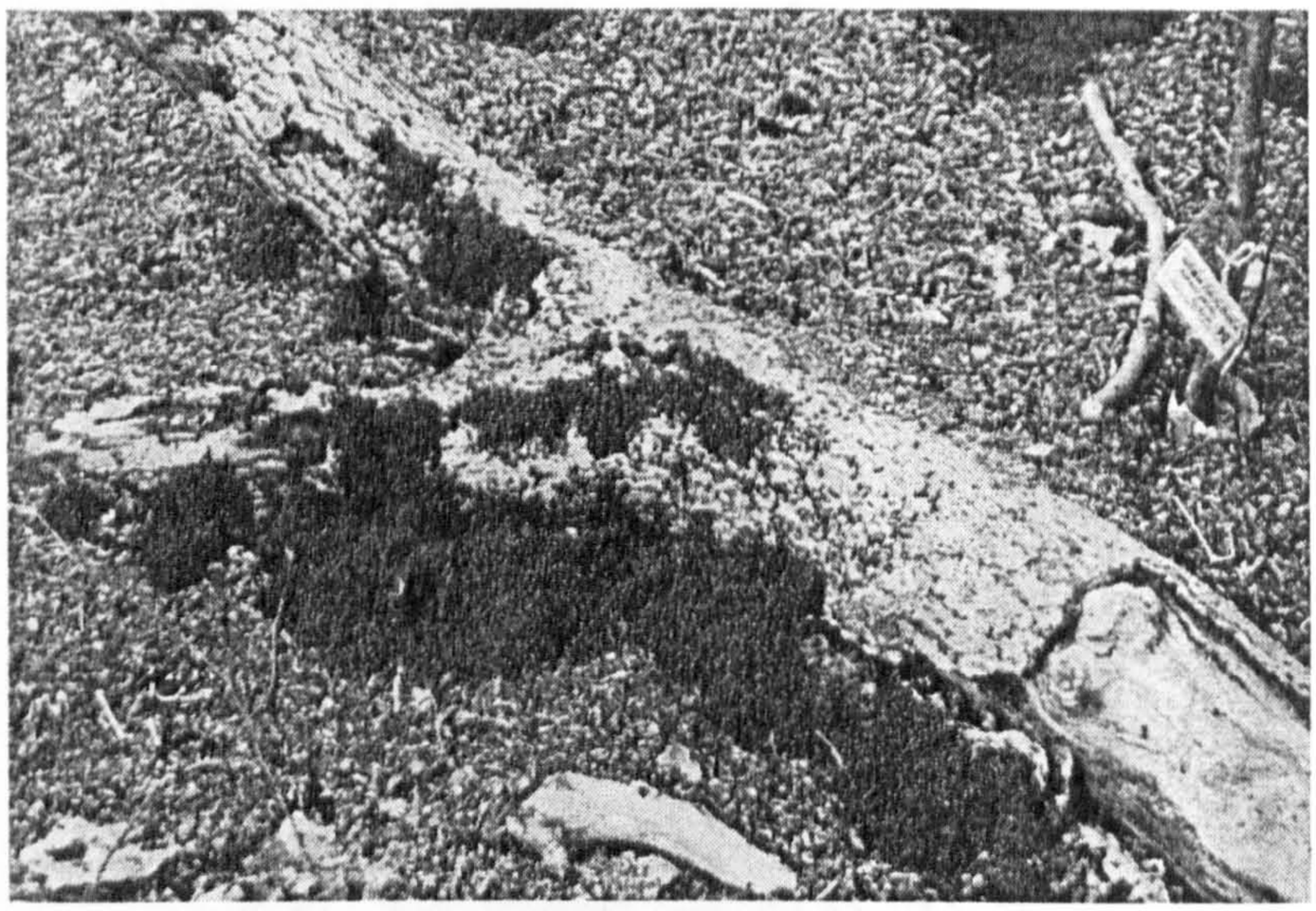


Figure 3.5: Clusters of individual *Formica rufa* workers, a) on top of a nest on a sunny day in January b) close up

a)



b)

The larger colonies produce sexuals (Brian 1979, p.165). The first eggs laid by the queen in spring develop into alate male and female sexuals which fly during May to early July. This is unusual, compared to other ant genera, because the sexuals are produced from food stores from the previous season rather than at the end of the season (Skinner 1976, p. 6). New nests arise from colony splitting in the spring (Collingwood 1979, p. 143; *pers. obs.*). The queen, accompanied by workers carrying nestmates and brood, walks to the new nest. In Britain all colonies are polygynous (up to 100 queens). A monogynous form is found in Europe, the *Formica rufa rufa* of Gößwald; average worker size of this form is generally large (Collingwood 1979, p. 143). Queens mate only once, receiving enough sperm to fertilise eggs for the rest of their lives. They are very long lived; Hölldobler and Wilson (1990, p. 169) noted a queen of *Formica sanguinea* lived for 20 years in a laboratory. Task bias in workers is related to age and size, young workers feed the larva and older workers forage for food (Brian 1983, p.

156). Workers emerging in June may forage the same season or wait until the following spring. Workers emerging later than June will not forage until the following year (Brian 1979, p. 163). It is unlikely that foragers live more than two years; *Myrmica* spp. workers are recorded as living between 1.1 and 2.6 years (Hölldobler and Wilson 1990, p. 169). Estimates of the number of workers in a nest vary, Collingwood (1979) suggested between 100 000 and 400 000 per nest.

F. rufa is omnivorous. Honeydew is an important dietary constituent and distinct foraging trails of workers are formed to aphid bearing trees. But it is also opportunistic, taking whatever insect, arthropod and earthworm prey it can catch (Brian 1983, p. 21; Collingwood 1979, p. 143; *pers. obs.*).

3.2 Description of the study area

The area chosen was Burnham Beeches NNR and SSSI, near Slough, Buckinghamshire (Ordnance Survey sheet 175, 1:50 000, grid reference SU 9585; Figure 3.6). It is an ancient woodland owned and maintained by the Corporation of London with day to day management carried out by keepers and there is also a resident ecologist, Dr. Helen Read. Much background information on the flora and fauna is available. Daily measurements of temperature are made on site (Read *pers. comm.*). Graphs of the average daily temperature for the study period are shown in Figure 3.7 to Figure 3.9.

Figure 3.6: Location of Burnham Beeches in the UK

Figure 3.7: Average daily temperature at Burnham Beeches for 1994

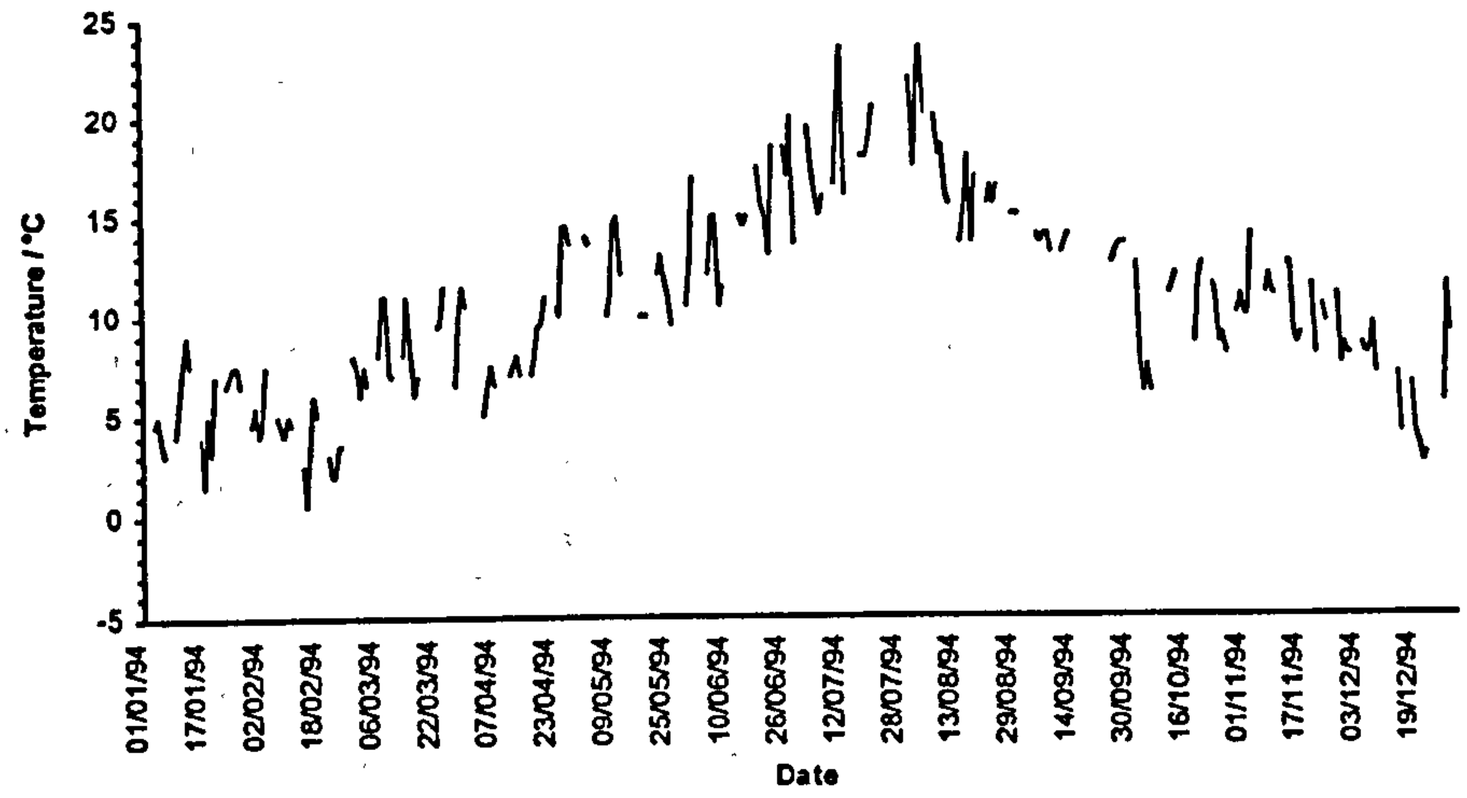


Figure 3.8: Average daily temperature at Burnham Beeches for 1995

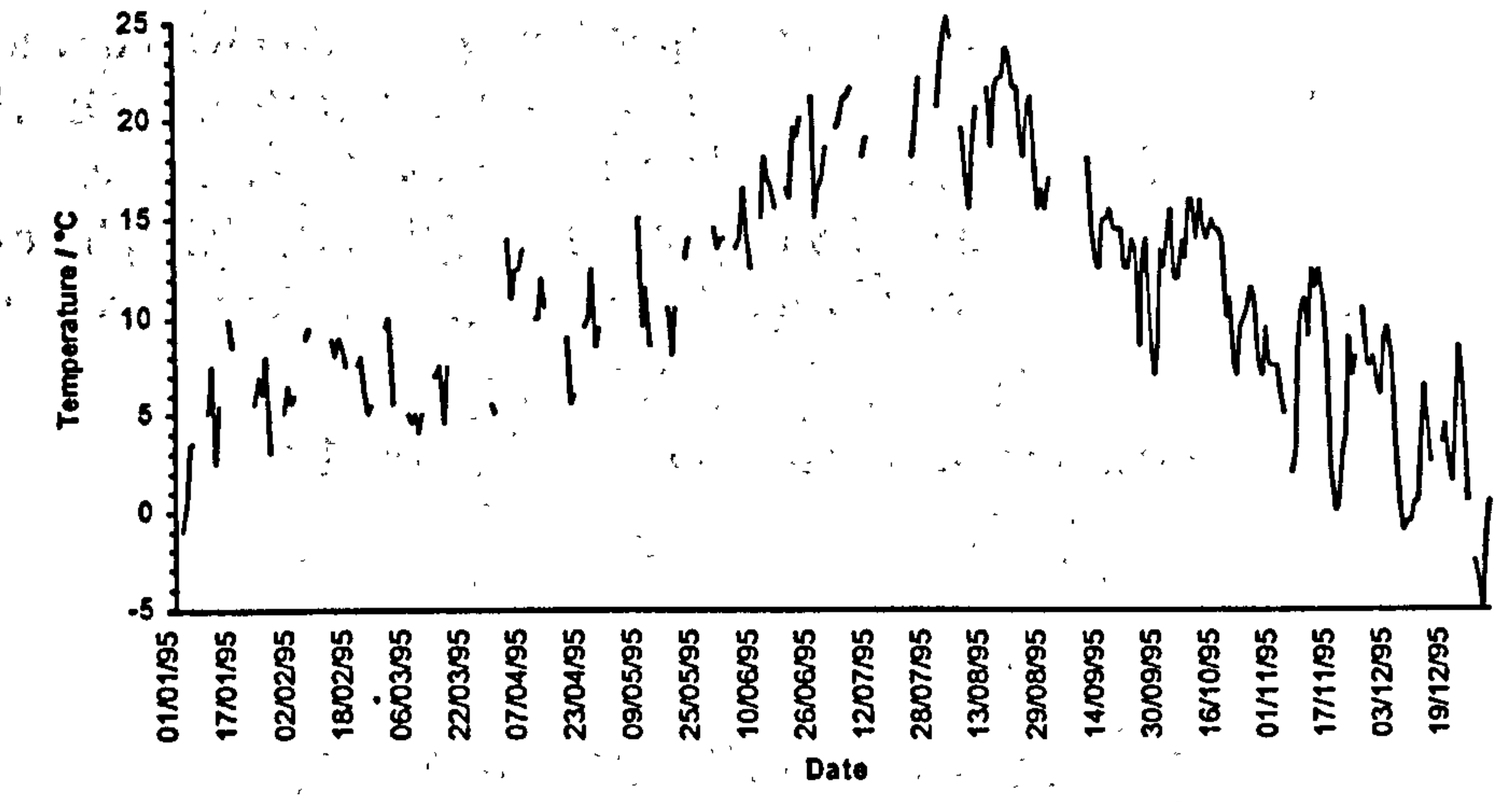
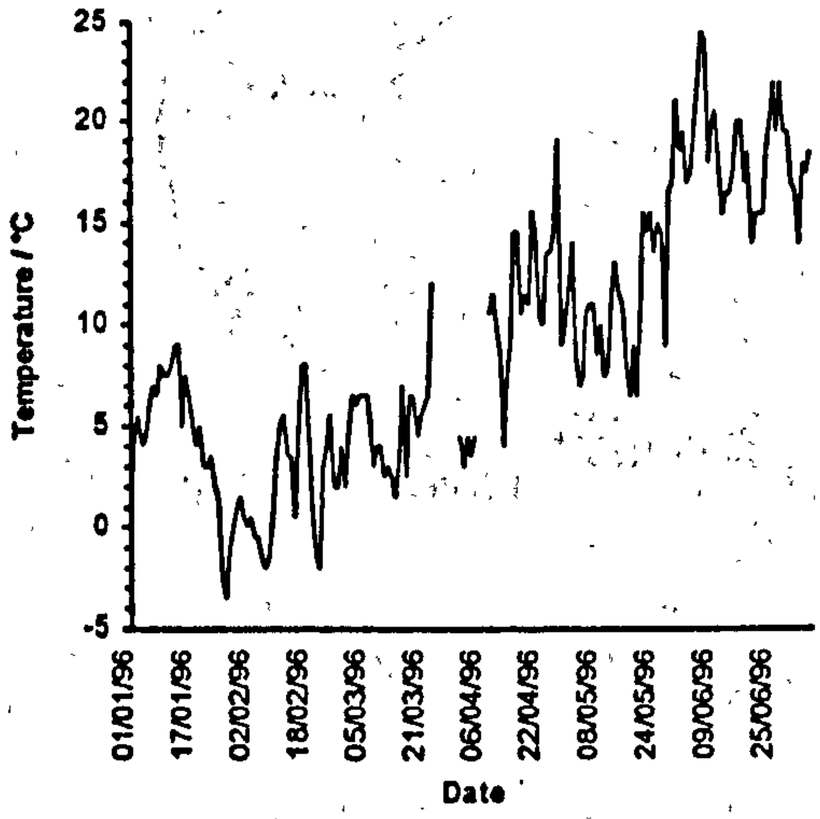


Figure 3.9: Average daily temperature at Burnham Beeches for 1996



Burnham Beeches has a total area of 220 hectares, with mostly acidic soil. There is a diversity of habitats, including heathland, scrubland, wetland and ponds as well as a large area of woodland (frontispiece). The woodland includes areas of ancient beech and oak pollards and coppice. About 80 hectares are being actively restored to wood pasture. The ground flora is typical of an acid beech woodland, for example cushion moss (*Leucobryum glaucum* (Hedw.) Ångstr.) and cow wheat (*Melampyrum pratense* L.) (Corporation of London 1993).

The top predator in Burnham Beeches is the red fox (*Vulpes vulpes* Linnaeus). During 1995, there were five recorded active earths within Burnham Beeches (Haugh *pers. comm.*). There are presently no badgers (*Meles meles* Linnaeus) in Burnham Beeches, although they have been recorded in the past (Read *pers. comm.*). Other mammals present include muntjac (*Muntiacus reevesi* (Ogilby)), grey squirrel (*Sciurus carolinensis* Gmelin) and bats (*Pipistrelle pipistrellus* (Schreber), *Myotis daubentoni* (Kuhl), *M. nattereri* (Kuhl), *M. ? branditti* (Eversmann) or *mystacinus* (Kuhl), *Nyctalus noctula* (Schreber) and *Plecotus auritus* (Linnaeus)). Smaller mammals include bank and field voles (*Cleithrionomys glareolus* (Schreber) and *Microtus agrestis* (Linnaeus)), common and pygmy shrews (*Sorex araneus* Linnaeus and *S. minutus* Linnaeus) and wood mice (*Apodemus sylvaticus* (Linnaeus)). All the common woodland birds are found in addition to the green, greater-spotted and lesser-spotted woodpeckers (*Picus viridis*, *Dendrocopos major* (Linnaeus) and *Dendrocopos minor* (Linnaeus)). Tawny owls (*Strix aluco* Linnaeus) and sparrowhawks (*Accipiter nisus* (Linnaeus)) are also found (Corporation of London 1993; Read *pers. comm.*).

Throughout the northern part of the woods, *F. rufa* is abundant. Over the last forty years, *F. rufa* has spread south from the Portman Burtley Estate (Brewer *pers. comm.*). Currently there are no *F. rufa* nests south of Lord Mayors Drive (Figure 3.10). *F. rufa* has few predators. The main vertebrate predator is the green woodpecker, which attacks nests during winter. The damage to nests is obvious with holes five to ten cm in diameter (de Bruyn, Goosen de Roo, Hubregtse van den Berg and Feijen 1972; Skinner 1976; Adams 1991, p. 94). The green woodpecker and the characteristic damage to the nests (Figure 3.11) are regularly seen in Burnham Beeches during the winter months (Read *pers. comm.*). Invertebrate predators are restricted to myrmecophiles, particularly the staphylinid beetle, *Zyras humeralis*.

A schematic representation of the Burnham Beeches woodland community is shown in Figure 3.12. This is a simple qualitative guide for the reader and is not meant to represent the food web of the woodland community.

Figure 3.10: Location of study sites within Burnham Beeches

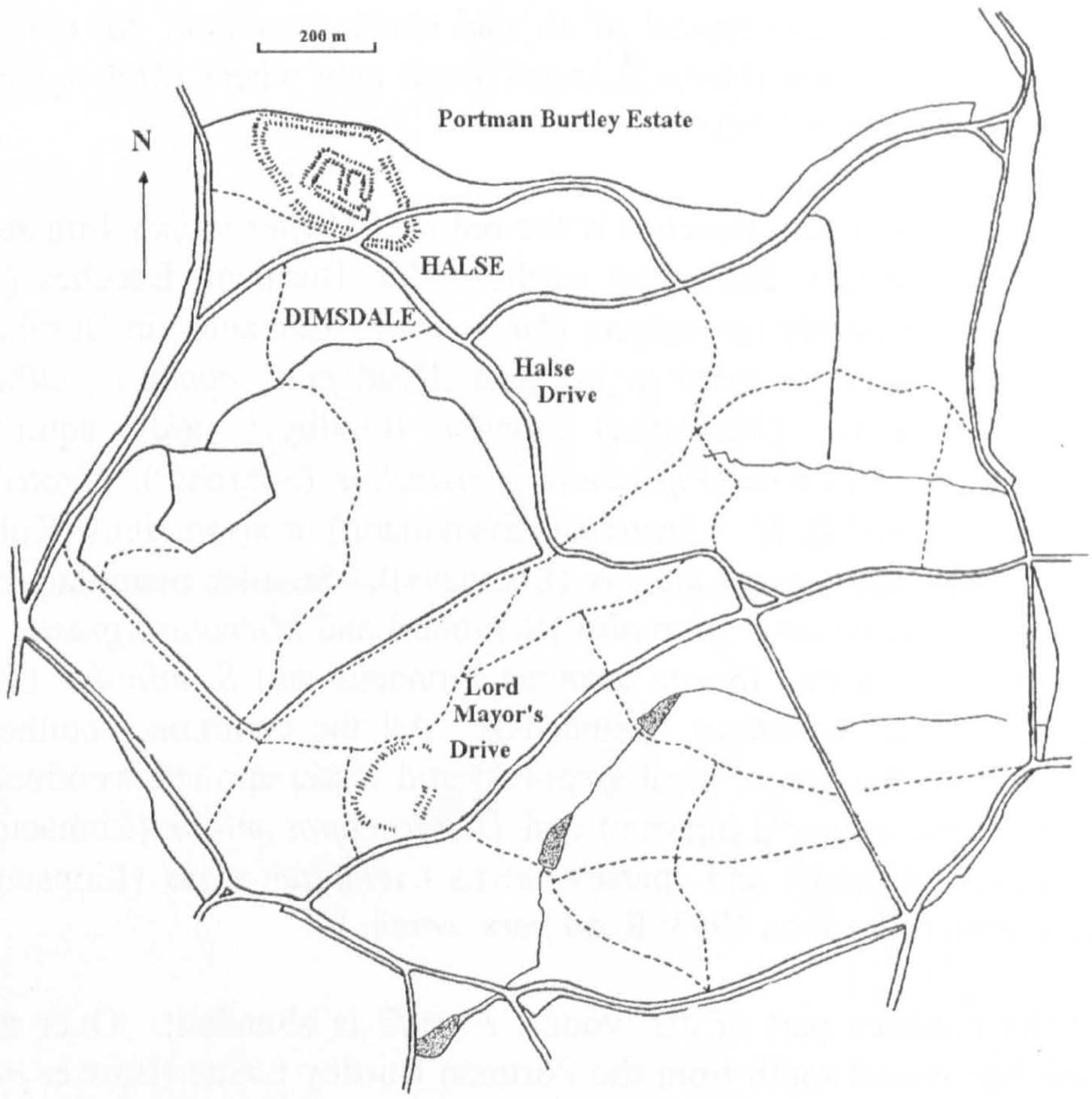
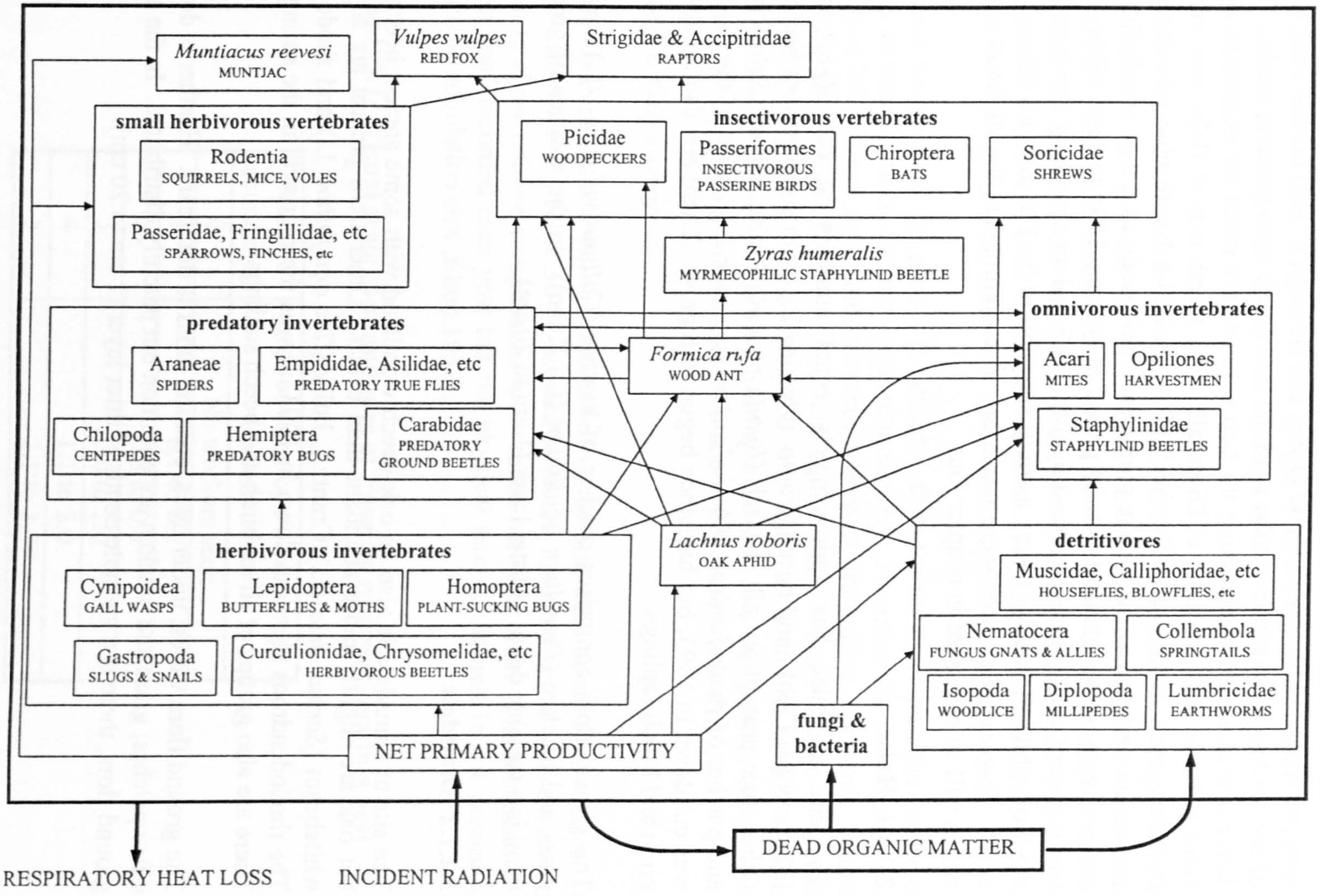


Figure 3.11: Characteristic green woodpecker damage to a *Formica rufa* nest in winter

Figure 3.12: Schematic representation of the Burnham Beeches woodland community (in the interests of clarity only the principal pathways are shown)



3.2.1 Description of study sites

Two sites within Burnham Beeches were chosen for the fieldwork; Halse is at the intersection of Halse Drive with Dukes Drive (SU 943855) and Dimsdale is near the intersection of Dimsdale Drive with Morton Drive (SU 945855) (Figure 3.10). The two sites are separated by a road, Halse Drive, and although *F. rufa* is often seen at the edges of the road and sometimes on the road, no trails were seen crossing roads. Thus Halse Drive acts as a barrier separating the two sites and the roads act as boundaries on three sides at Halse and two sides at Dimsdale. The fourth side at Halse was marked by a boundary bank making a study site (250 m by 200 m) with nine permanent nests (a permanent nest is defined for the purposes of this study as a nest which did not move and was active throughout the study period of January 1994 to June 1996). The other two sides at Dimsdale were marked by a footpath and an imaginary line from the end of the footpath to the road, making a study site (350 m by 170 m) with fifteen permanent nests. Two separate sites were necessary to accommodate the different experiments which will be discussed in chapter four.

3.2.1.1 Halse

The site at Halse has approximately equal numbers of oak (*Quercus petraea* (Mattuschka) Liebl.) and beech (*Fagus sylvatica* L.), with some ancient beech pollards. Other trees present are silver birch (*Betula pendula* Roth), willow (*Salix ?caprea* L.) and patches of rhododendron (*Rhododendron ponticum* L.). Most of the rhododendron was cut down in 1993, but has since begun to regrow. There are also groups of silver birch and beech saplings.

The ground flora comprises patches of heather (*Calluna vulgaris* (L.)), cow wheat, grass and bracken (*Pteridium aquilinum* (L.) Kuhn). In the absence of ground flora, there is a variable depth of litter layer (1 cm to 20 cm).

3.2.1.2 Dimsdale

The site at Dimsdale is also an oak-beech woodland with some ancient beech pollards, but oak are slightly more abundant than beech. Other trees present are silver birch, whitebeam (*Sorbus aria* (L.) Crantz.), holly (*Ilex aquifolium* L.) and rhododendrons. The rhododendrons were cut down in 1993, as was the regrowth in the spring of 1996. There are also groups of silver birch and beech saplings.

The ground flora varies; under trees, cushion moss is dominant. Heather is dominant in a few patches; grass and bracken are common but patchily distributed. In the absence of ground flora, there is a variable depth of litter layer (1 cm to 20 cm).

3.3 Methods

3.3.1 Location maps of trees and Formica rufa *nests*

For each site, a location map of the trees and *F. rufa* nests was made. Every nest and tree of more than 5 cm in girth at 1.5 m height within each study site was given a number, labelled and mapped. Groups of saplings, mainly beech and silver birch, were mapped as one unit.

A reference tree was chosen and within a 25 m radius, a compass bearing was taken from the reference tree to every nest or tree and the distance between the two measured with a tape measure. On completion a new reference tree was then chosen and the process repeated until all the trees had been recorded. The compass bearing and distance between reference trees were also recorded. The map was then constructed by relating all the trees to the first tree. New nests were mapped as they appeared.

When a tree was mapped, the greater the distance from the reference tree, the greater the error was in bearing taken and the distance measured. Therefore the numbers of trees greater than 25 m from away the reference tree were minimised. A more accurate method would be to use a theodolite, but this equipment was not available. An easier method of mapping trees, based solely on tree diameter and tree to tree distance measurements without the need to take bearing measurements was published by Boose, Boose and Lezberg (1998), unfortunately too late to be used for this study.

3.3.2 Nest activity survey

No attempt was made to count the number of workers in each nest. A visual scale of abundance from 0 to 5 (Table 3.1) was used to record the numbers of workers seen on each nest to allow relative comparisons to be made between nests. The dimensions of each nest were recorded each year but the physical size of the nest is not necessarily related to the population size (Elton 1932).

Table 3.1: Visual scale of abundance of *Formica rufa* workers in a nest

Scale of abundance	Area covered by *Formica rufa* workers / m^2
0	No workers seen
1	0.1 to 0.2
2	0.3 to 0.5
3	0.6 to 1.0
4	1.1 to 2.0
5	2.1 to 3.0

3.3.3 Experimental colonies

Two *F. rufa* colonies within each of the two study sites were chosen, one to be manipulated and one to act as control (Figure 3.10). However, in some cases colonies consisted of multiple nests and the first year was spent establishing the foraging areas of each colony prior to experimentation in subsequent years. The abundance of *F. rufa* was studied in more detail within 25 m of the colony. The area surrounding each of the four chosen nests was delineated using a 5 m interval grid to aid sampling.

With the colony at the centre or as near as possible, the grid was marked out using laminated labels secured in the ground with 15 cm long nails. Where the colony was polydomous, one nest was chosen to be at the centre of the grid. The grids were not all the same size, due to the presence of roads. The maximum dimensions of each grid are shown in Table 3.2.

Table 3.2: Maximum dimensions for sampling grid around the four experimental colonies

Sample site	Nest number	Maximum dimensions /m
Dimsdale 1	10D	50 by 55
Dimsdale 2	1D	60 by 60
Halse 1	1H	50 by 60
Halse 2	9H	55 by 70

3.3.4 Distribution of trees around nests

The composition of the trees within a 5 m and a 20 m radius of each nest in Dimsdale and Halse was compiled. Nests were not included if not all the trees within the area were known or where areas contained roads.

To investigate whether the siting of a nest was influenced by the composition of trees in the immediate vicinity, a program was written in C which randomly selected 10,000 points within each site and compiled the composition of the trees within a 5 m and a 20 m radius of each point.

3.4 Results

3.4.1 Location of Formica rufa *nests in the study sites*

There were nine permanent (active throughout the study period and did not relocate) and eleven transient (recorded as active at least once during the study period) nests in the Halse study site (Figure 3.13) and fifteen permanent and fifteen transient nests in the Dimsdale study site (Figure 3.14).

Of the permanent nests, 71 % were built in or around dead tree stumps or fallen logs, as compared with only 21 % in open ground and 8 % at the base of live trees (Table 3.3). Of the nests found in open ground, 69 % were only active for one or two years. The death of a tree creates a gap in the canopy which lets sunlight in to warm the nest in winter and early spring, whilst the leaves on surrounding trees and sometimes ground vegetation provides some shade in summer. Clusters of *F. rufa* were seen on the south facing slopes of nests on sunny days in January and February (Figure 3.5).

Table 3.3: Survey of the positioning of the nests in the two study sites

Frequency refers to total number of nests active for at least one year within the sites during the study period. Numbers in brackets refer to those nests continuously active within the study period (January 1994 to June 1996).

Nest position	Frequency		Total number of nests	% occurrence
	Halse	Dimsdale		
Stump/dead tree	9 (5)	4 (4)	13 (9)	26(38)
Fallen tree/log	5 (3)	10 (5)	15 (8)	30(33)
Base of live tree	1 (0)	5 (2)	6 (2)	12(8)
Open ground	5 (1)	11 (4)	16 (5)	32(21)

3.4.2 Nest activity survey

This most noticeable difference in nest activity between 1994, 1995 and 1996 was the appearance of six new nests and two being abandoned at Halse in 1996. The satellite nest 12aH appeared briefly in May 1995. Nest 10H changed position twice during the study period. The rest of the permanent nests showed similar levels of activity throughout the study period including nest 9H which was deprived of food (Table 3.4).

There were eight new nests at Dimsdale in 1996. Nest 7D and 8D had low levels of activity in 1994 and appeared to be abandoned in May 1995. In July 1995 they seemed inhabited again and grew in activity by June 1996. Nests 12D, 14D and 20D grew continually throughout the study period. Nest 13D changed position during 1995. The rest of the permanent nests showed similar levels of activity throughout the study period (Table 3.5).

3.4.2.1 Nearest neighbour analysis

The distance to nearest neighbour measure developed by Clark and Evans (1954) was used to describe the spatial distribution of *F. rufa* nests. It is best used for large sample sizes (n>100). Despite this, it is the most commonly used spatial statistic amongst ant workers (Levings and Traniello 1981), even with a small number of ant nests; for example, Ryti and Case (1986), Traniello and Levings (1986) and Weseloh (1994). It should be noted that when nest density is very low (6-12 nests in 625m^2) the measure is biased towards regular spacing.

Figure 3.13: Location of all nests (active at anytime during the study period) and trees within the Hallse study site

Figure 3.14: Location of all nests (active at anytime during the study period) and trees within the Dimsdale study site

Table 3.4: Dimensions and visual assessment of *Formica rufa* worker activity of nests in Halse for 1994 to 1996

Date	05/07/94		29/03/95*	31/05/95	
	Abundance	Area / m^2	Abundance	Abundance	Area / m^2
1H	4	0.44	4	4	3.14
2H	4	0.75	2	4	1.00
3H	2	0.60	2	2	0.75
4H	2	0.79	2	2	0.20
5H	2	0.79	2	3	0.44
6H	2	0.79	2	3	0.44
7H	4	7.07	3	5	2.41
8H	4	3.14	3	4	2.00
9H	4	3.14	2	3	0.88
10H	1	0.44	1		moved to 10aH
10aH				1	0.20
11H	4	2.00	2	4	3.14
12H	1	0.20	1	2	0.20
12aH				1	0.05

*The nests had not yet been rebuilt after the weathering over the winter months, so the dimensions were not recorded

Date	12/07/95		28/06/96	
	Abundance	Area / m^2	Abundance	Area / m^2
1H	5	4.91	4	1.00
2H	4	3.00	3	1.00
3H	3	1.00	0	died out
4H	2	0.79	3	0.79
5H	3	3.14	3	0.79
6H	3	3.14	0	died out
7H	5	7.07	5	1.50
8H	4	4.50	4	2.00
9H	3	1.00	4	1.00
10H			1	0.05
10aH	1	0.20		moved back to 10H
11H	5	4.91	4	1.77
12H	3	0.79	2	0.44
12aH		dead		
13H			2	0.20
14H			2	0.20
15H			2	0.20
16H			2	0.20
17H			1	0.05
18H			2	0.44

Table 3.5: Dimensions and visual assessment of *Formica rufa* worker activity of nests in Dimsdale for 1994 to 1996

Date	05/07/94		29/03/95*	31/05/95	
	Abundance	Area / m^2	Abundance	Abundance	Area / m^2
1D	4	2.00	3	4	1.77
2D	2	0.79	3	3	0.79
3D	4	3.14	4	4	3.14
4D	1	0.79	0	1	0.20
5D	2	1.77	3	3	3.14
6D	3	1.77	4	3	1.77
7D	1	Not obvious	0	0	died out?
8D	1	Not obvious	1	0	died out?
9D	3	3.14	4	4	0.79
10D	4	7.07	3	4	3.14
11D	3	1.00	3	3	0.44
12D	2	0.79	4	4	1.50
13D	2	0.79	1	2	0.44
14D	2	3.14	4	4	0.79
15D	3	3.00	5	5	2.50
16D	4	3.00	5	5	1.77
17D	5	7.07	4	4	1.77
18D	4	1.77	3	3	2.41
19D			0	2	0.20
20D	1	0.20	2	3	0.79

*The nests had not yet been rebuilt after the weathering over the winter months, so the dimensions were not recorded

Table 3.5 (continued)

Date	12/07/95		28/06/96	
	Abundance	Area / m^2	Abundance	Area / m^2
1D	4	3.14	4	1.77
2D	3	0.79	3	0.50
3D	4	1.77	4	1.77
4D	1	0.20	2	0.20
5D	3	0.79	2	0.05
6D	3	1.77	4	0.79
7D	1	0.13	3	0.44
8D	1	0.13	2	0.20
9D	4	1.77	4	1.77
10D	4	3.14	3	0.50
10aD			1	0.05
11D	3	0.79	3	0.79
12D	4	1.77	5	2.00
13D	3	0.79		Moved to 13aD
13aD			3	0.20
14D	4	3.14	4	1.77
15D	5	7.07	5	1.50
16D	5	4.91	4	0.20
17D	4	3.14	4	1.77
18D	3	1.77	4	1.23
19D	2	0.20	3	0.20
20D	3	0.79	4	1.77
21D			3	0.44
22D			3	0.44
23D			3	0.44
24D			1	0.05
25D			2	0.20
26D			1	0.05
27D			3	0.79
28D			2	0.20

The index of aggregation (R) is equal to the mean distance to the nearest neighbour (r_A) divided by the expected distance to the nearest neighbour assuming a random distribution (r_E). If the spatial pattern is random, R=1; when aggregation occurs R approaches 0; when there is a regular pattern R approaches an upper limit of 2.15. The significance of the departure of r_A to r_E can be tested by the normal curve by calculating the standard variate (z).

Since the nearest neighbour of a nest could be a nest outside the study area, an unbiased estimate of R requires that the census area is surrounded by a boundary strip. The census area for Dimsdale was 150 m by 150 m and for Halse 160 m by 160 m. Since this is a smaller area within the study area, the number of nests decreases. A correction can be applied to the measure if a boundary strip is not used which maximises the sample size. However, this correction is not appropriate in this case because both study sites are rectangular and the edge effects are overwhelming (Krebs 1989, p. 129).

R and z were calculated for Dimsdale and Halse for each year of the study period (1994 to 1996). The results are presented in Table 3.6. Clark and Evans measure assumes that points of measure are themselves infinitesimally small. Since biological entities have a finite size, Simberloff (1979) introduced a correction factor to allow for the size of the entity (as a circle). This is an appropriate correction to use for *F. rufa* nests, since the nest diameter can often be large. The ratio of expected mean nearest neighbour distance for circles to expected mean nearest neighbour distance for points (r_EC:r_EP) can be calculated for the nests in Dimsdale and Halse (Table 3.7).

Table 3.6: R and z for Dimsdale and Halse for each year of the study period (1994 to 1996).

* significant at 5 % level, ** significant at 1 % level, *** significant at 0.1 % level and ns, not significant

Study site	Year	Number of active nests	Nest density / m^2	R	z	Significance
Dimsdale	1994	17	0.0007	1.12	0.96	ns
	1995	17	0.0007	1.12	0.96	ns
	1996	24	0.0006	1.00	-0.02	ns
Halse	1994	10	0.0003	1.66	4.02	***
	1995	11	0.0004	1.37	2.35	*
	1996	16	0.0006	1.09	0.69	ns

Table 3.7: Ratio of mean expected nearest neighbour distances for circles to mean nearest neighbour expected distances for points for the nests in Dimsdale and Halse for the study period (1994 to 1996)

Study site	Year	$r_E C:r_E P$
Dimsdale	1994	0.1
	1995	0.09
	1996	0.06
Halse	1994	0.05
	1995	0.08
	1996	0.01

In Dimsdale for all three years the spatial distribution of the *F. rufa* nests was not significantly different from random, although *R* shows that the pattern tends towards regular for 1994 and 1995. In Halse the spatial distribution of *F. rufa* nests was significantly different from random in 1994 (z=4.02, $p<0.001$) and 1995 (z=2.35, $p<0.05$) tending towards regular. In 1996 the spatial distribution was not significantly different from random. It should be noted that the nest densities are very low and therefore the measure is biased towards regular spacing.

The values for $r_E C:r_E P$ in Table 3.7 are very small and therefore the equations of Clark and Evans (1954) are sufficiently accurate not to apply a correction factor. This is as expected since, although the nest diameters are quite large, the nests are a long way apart and thus the effect of the diameter is reduced. Simberloff (1979, p. 681) contains a graph which, knowing the ratio, gives the corresponding correction factor. Where the ratio is above 0.5, using the equation for mean nearest neighbour distances for points, when the entity has finite size, is erroneous and the correction factor should be applied.

3.4.3 Location maps for trees in the study sites

3.4.3.1 Halse

The range of trees found in the Halse study site are shown in Table 3.8. Beech and oak are most abundant, between them accounting for 78.1 % of the total number of trees. The location of all trees is shown in Figure 3.13.

Table 3.8: Composition of tree species over 5 cm in trunk diameter at a height of 1.5 m in the Halse study site

Species	%
Beech	38.8
Oak	37.3
Silver birch	16.3
Group of saplings	3.4
Whitebeam	2.1
Salix ?caprea	1.8
Holly	0.1
Mountain ash	0.1
Prunus sp.	0.1

3.4.3.2 Dimsdale

The range of trees found in the Dimsdale study site are in Table 3.9. As with Halse, oak and beech are most abundant; slightly more oak than beech. Jointly they account for 82.8 % of the total number of trees. The location of all trees is shown in Figure 3.14.

Table 3.9: Composition of tree species over 5 cm in trunk diameter measured at a height of 1.5 m in the Dimsdale study site

Species	%
Oak	44.6
Beech	38.2
Silver birch	10.6
Holly	2.9
Whitebeam	2.7
Group of saplings	0.9
Pine	0.1

3.4.4 Distribution of trees around nests

The composition of tree species within 5 m and 20 m of permanent and transient nests in Dimsdale (Table 3.10 and Table 3.11) and Halse (Table 3.12 and Table 3.13) was compiled.

Table 3.10: Numbers of different tree species within a 5 m and a 20 m radius around permanent nests in Dimsdale

Nest	5 m radius of nest				20 m radius of nest			
	Oak	Beech	Silver birch	Other	Oak	Beech	Silver birch	Other
1D	0	0	1	0	5	9	2	8
2D	0	0	1	0	4	9	3	9
3D	0	0	0	0	6	13	2	5
5D	0	0	0	0	9	2	1	1
6D	0	0	0	0	11	7	0	0
10D	0	1	18	3	23	19	22	13
12D	0	0	0	0	11	1	0	0
14D	0	0	0	0	14	13	12	1
18D	0	0	0	0	29	5	1	1
20D	0	2	0	0	4	2	0	0
Mean	0	0.2	2.0	0.3	11.6	8.0	4.3	3.8
Standard deviation	0	0.4	5.3	0.9	8.0	5.5	6.8	4.4

Table 3.11: Numbers of different tree species within a 5 m and a 20 m radius around transient nests in Dimsdale

Nest	5 m radius of nest				20 m radius of nest			
	Oak	Beech	Silver birch	Other	Oak	Beech	Silver birch	Other
4D	0	0	0	0	9	28	1	2
7D	0	1	0	0	6	11	1	0
8D	0	0	0	0	11	8	0	0
10aD	2	1	0	1	25	13	24	5
19D	0	0	0	0	14	12	0	0
21D	2	3	0	0	6	18	0	1
22D	1	0	0	0	6	11	0	0
23D	0	0	0	0	2	8	1	0
Mean	0.6	0.6	0	0.1	5.1	4.7	5.2	1.3
Standard deviation	0.9	1.0	0	0.3	6.7	6.2	7.8	1.7

Table 3.12: Numbers of different tree species within a 5 m and a 20 m radius around permanent nests in Halse

Nest	5 m radius of nest				20 m radius of nest			
	Oak	Beech	Silver birch	Other	Oak	Beech	Silver birch	Other
1H	0	0	5	0	-	-	-	-
2H	0	2	0	0	0	18	0	0
4H	0	0	0	0	-	-	-	-
5H	0	0	1	0	8	10	14	0
7H	0	0	0	0	15	3	0	0
9H	0	0	3	0	4	10	25	2
11H	0	1	0	0	2	4	5	1
Mean	0	0.4	1.3	0	5.8	9.0	8.8	0.6
Standard deviation	0	0.7	1.8	0	5.3	5.4	9.6	0.8

Table 3.13: Numbers of different tree species within a 5 m and a 20 m radius around transient nests in Halse

Nest	5 m radius of nest				20 m radius of nest			
	Oak	Beech	Silver birch	Other	Oak	Beech	Silver birch	Other
6H	1	0	1	0	16	7	8	1
13H	0	0	1	0	8	3	3	0
14H	0	0	0	0	9	6	29	2
15H	0	0	4	0	6	8	24	1
17H	1	0	0	0	16	2	1	0
18H	0	0	0	0	3	20	1	0
Mean	0.3	0	1.0	0	9.7	7.7	11.0	0.7
Standard deviation	0.5	0	1.4	0	4.9	5.9	11.3	0.7

For Dimsdale and Halse, the tree composition around 10,000 points was compiled for a 5 m and a 20 m radius of each point. The mean number of each tree species is shown in Table 3.14 and Table 3.15.

Table 3.14: Mean numbers of different tree species compiled from 10 000 random points with a 5 m radius and a radius 20 m radius for Dimsdale

	5 m radius from point				20 m radius from point			
	Oak	Beech	Silver birch	Other	Oak	Beech	Silver birch	Other
Mean	0.9	0.7	0.4	0.2	15.2	11.8	5.4	2.8
Standard deviation	1.1	1.1	1.6	0.7	6.8	5.9	10.3	3.0

Table 3.15: Mean numbers of different tree species compiled from 10 000 random points with a 5 m radius and a radius 20 m radius for Halse

	5 m radius from point				20 m radius from point			
	Oak	Beech	Silver birch	Other	Oak	Beech	Silver birch	Other
Mean	0.5	0.7	0.3	0.1	8.7	10.6	4.6	0.9
Standard deviation	0.8	1.1	1.0	0.3	5.4	5.8	6.7	1.5

Three groups were identified, permanent nests, transient nests and random points within each study site. The means within each group are different for each tree species, therefore an F test (Siegel and Morgan 1996, p. 439) was used to look for significant differences between these three group means at 5m and 20 m radii from the nest or point for Dimsdale (Table 3.16) and Halse (Table 3.17).

Table 3.16: F test for differences between group means (permanent, transient and random points) for a 5 m radius and a 20 m radius for Dimsdale

ns = not significant, * = significant at 5 % level.

	5 m radius				20 m radius			
	Oak	Beech	Silver birch	Other	Oak	Beech	Silver birch	Other
F statistic	3.8	1.1	5.7	0.1	3.2	2.5	0.2	2.0
Significance	*	ns	*	ns	*	ns	ns	ns

Table 3.17: F test for differences between group means (permanent, transient and random points) for a 5 m radius and a 20 m radius for Halse

ns = not significant, * = significant at 5 % level.

	5 m radius				20 m radius			
	Oak	Beech	Silver birch	Other	Oak	Beech	Silver birch	Other
F statistic	1.5	1.5	4.9	0.3	0.8	1.0	3.7	0.1
Significance	ns	ns	*	ns	ns	ns	*	ns

For the significant results, a modified t test, (using the pooled estimate of variability as estimated by all of the groups even though the groups are being compared two at a time) (Siegel and Morgan 1996, p. 445) can be performed to identify the specific group pairings which are significantly different in Dimsdale (Table 3.18) and Halse (Table 3.19). The results show that of the six significant results, three were for permanent nests and random points, two were for transient nests and random points and one for permanent nests and transient nests. Therefore in general significant differences were found between means of trees around nests as compared to random points within each of the study sites.

Table 3.18: Modified t test to identify significantly different group pairings for a 5 m radius and a 20 m radius for Dimsdale

ns = not significant, * = significant at 5 % level, - = F test not significant, therefore t test not performed.

	5 m radius			20 m radius		
	Permanent against transient	Permanent against random points	Transient against random points	Permanent against transient	Permanent against random points	Transient against random points
Oak	ns	*	ns	ns	ns	*
Beech	-	-	-	-	-	-
Silver birch	*	*	ns	-	-	-
Other	-	-	-	-	-	-

Table 3.19: Modified t test to identify significantly different group pairings for a 5 m radius and a 20 m radius for Halse

ns = not significant, * = significant at 5 % level, - = F test not significant, therefore t test not performed.

	5 m radius			20 m radius		
	Permanent against transient	Permanent against random points	Transient against random points	Permanent against transient	Permanent against random points	Transient against random points
Oak	-	-	-	-	-	-
Beech	-	-	-	-	-	-
Silver birch	ns	*	ns	ns	ns	*
Other	-	-	-	-	-	-

3.5 Discussion

Except for 1994 and 1995 at Halse, the spatial distribution of *F. rufa* nests does not differ significantly from random, although there is a tendency towards a regular pattern in all cases, significantly so for Halse in 1994 (z=4.02, p<0.001) and 1995 (z=2.35, p<0.05). Skinner (1980b) used the nearest neighbour technique and found the spacing of *F. rufa* nests at his site in northern England tended toward regular spacing (z=1.65, p<0.01), although, as with this study, the sample size was small. Adams (1991, p. 76) used the nearest neighbour technique for three sites in Blean Woods, Kent and all tended towards regular spacing: "Compartment 10" had 31 nests, z=4.49, p<0.001; "Wide Ride" had 19 nests, z=3.29, p<0.001 and "Compartment 9" had 29 nests, z=2.23 , p<0.05.

Overdispersion (regular spacing) is taken by many authors as evidence of competition (Bernstein and Gobbel 1979; Levings and Franks 1982; Cushman, Martinsen and Mazeroll 1988; Ryti 1991 and a review by Levings and Traniello 1981). However, as Ryti and Case (1986) point out there are alternate hypotheses to explain regular spacing which do not involve competition, such as microhabitat preferences. Herbers (1989) showed that the availability of suitable nest sites structured two ant communities in northern temperate deciduous forest in Vermont and New York, USA. In this study it was found that the favoured nest site location for a successful *F. rufa* nest was where a gap has been created in the canopy by a fallen tree. The tree location maps shows how patchily the trees are distributed, as do the large standard deviations of the mean tree composition around random points within each study site (Table 3.14 and Table 3.15). There are large areas where there are no trees and some areas where there are many trees clumped together. Adams (1991) also noted the patchy distribution of oak at his sites. Adams (1991, p. 181) examined 300 *F. rufa* nests in Blean Woods, Kent and found all were based on a rotting tree stump or equivalent. He also found that nests regularly

moved position, as did Welch (1978) who surveyed the same area. Elton (1932) noted changes in positions of some *F. rufa* nests in the New Forest, Hampshire.

Skinner (1980b) compared the trees within a 5 m radius of nests with the number of trees in the whole study site. There were no significant differences and the sample size was small, but the trend was towards nests being located near stands of sycamores (note that the percentages in Table 2 on page 388 of Skinner (1980b) are the wrong way round). Sycamores represented 68 % of the total number of trees within 5 m of a nest and 61 % of the total number of trees in his study site. Oaks represented 17 % and 10 % respectively. He claimed, therefore, that the presence of sycamores was important in nest site selection.

This study shows that for oak and beech, the mean number of trees within 5 m of a nest is always lower, often zero, than the mean number around a random point. If a permanent nest is taken as a successful nest (due to its persistence) then successful nests are in more open areas as compared to the site as a whole. There is some evidence from the t test results that the mean number of oak trees around nests at Dimsdale differs significantly from the mean number around a random point within the study site. This agrees with the survey of positioning of nests which found that permanent nests were more likely to be located in gaps formed by fallen trees (Table 3.3 and discussion above). From the t test calculations it would appear that there is a significant trend for nests in Dimsdale and Halse to be closer to silver birches in comparison to the mean around a random point in each study site. However, in the case of Dimsdale this effect is due to the atypical large number of silver birches found around nest 10D and its small transient satellite 10aD. In the case of Halse, the effect is due to the atypical large number of silver birches found around nest 9H and its small transient nests 14H and 15H. In both cases the silver birches all have girths less than 10 cm.

Blanford (1994, p. 8) compared the number of oak and beech trees within 20 m of ten *F. rufa* nests in Burnham Beeches (note the unforaged and foraged column labels on Table 4.1 of Blanford (1994) are the wrong way round). The oak and beech tree composition within 20 m of a nest was 18.7 oak trees and 17.1 beech trees. The average number of oak and beech trees within 20 m of a nest (Table 3.10 to Table 3.13) are higher than for this study, reflecting a difference choice of study site within Burnham Beeches.

Chapter 4: Variability in the foraging patterns of *Formica rufa* colonies

4.1 Introduction

This chapter describes changes in foraging behaviour of *Formica rufa* in the two study sites, Dimsdale and Halse. Patterns in foraging activity of *F. rufa* in trees on a large scale were investigated and for four nests were studied in more detail. The foraging areas of *F. rufa* nests were measured within and between years in the study period.

Ecosystems are naturally dynamic and in temperate regions changes in foraging area are often seasonal. The two study sites encompassed a number of nests, both permanent and transitory (section 3.4.1) and the changes in foraging areas of these nests were monitored to observe seasonal change. An experiment was performed to investigate how food availability affected the stability of the foraging area of the different colonies. The food supply of two *F. rufa* colonies was experimentally altered and the behaviour of *F. rufa* monitored. An increased food supply to a colony of *F. rufa* (10D) was achieved by supplementary feeding of a colony. A decrease in food supply to another colony (9H) was achieved by grease-banding trees to prevent workers from reaching the aphid *Lachnus roboris*, which is the main source of honeydew, and from foraging for prey in the trees. The experiment also included appropriate control colonies in which the food supply was unaltered (1D and 1H).

Previous experiments with granivorous desert ants (*Veromessor pergandei* and *Pogonomyrmex californicus*) in which additional food has been supplied have shown that alate production is increased (Ryti and Case 1988). Thus sexual production of nests within the study sites was recorded.

4.1.1 Dietary requirements of Formica rufa

F. rufa has two main dietary requirements, protein for growth and reproduction and carbohydrate for energy (Sudd 1987, p, 82). On average, over a season, they are required in approximately equal amounts, but relative importance changes with the time of year. Thus, in early spring there is a strong demand for carbohydrate whilst later on when brood is present, protein is more important (Deslippe and Savolainen 1994, p. 762). *F. rufa* collects honeydew from different aphid species and this is the main source of carbohydrate. Skinner (1980a, p. 430) found that almost all the honeydew gathered by *F. rufa* on sycamore (*Acer pseudoplatanus* L.) was from *Periphyllus testudinaceous*, whilst Wellenstein (1952, p. 448) observed *F. rufa* tending many different aphid species on a wide variety of tree species, including *L. roboris* on oak.

Protein is obtained from prey which consists mainly of other invertebrates. The workers rely on vision to locate their prey (Donisthorpe 1927) and they will capture a wide variety which they may either carry individually, or in the case of larger prey items such as beetles, recruit other workers to help. The work of Skinner (1980a, p. 431) showed

that foragers spend 80 % of their time in the tree canopy. A wide variety of prey is taken at Burnham Beeches, particularly Homoptera (Blanford 1994, p. 31; *pers. obs.*). Whilst groups of *F. rufa* have been noted attacking large invertebrates such as earthworms, slugs and beetles, more usually smaller invertebrate prey are taken by one or two *F. rufa* workers (*pers. obs.*).

4.2 Methods

4.2.1 Method to define nest foraging area

4.2.1.1 Aggressive behaviour

Initially it was intended to follow the method of Skinner (1980b) who used aggression as a means of determining the limits of the foraging areas of each colony. He found that when workers of *F. rufa* from different colonies, were placed together they showed aggression towards each other. He used this information to determine from which colony the foragers collected from each tree were from and using this information, territory boundaries were defined. This method was also successfully used by Adams (1991, p. 44) when studying the ecology of *F. rufa* in Kent.

In Burnham Beeches, however, *F. rufa* workers from different colonies were shown not to be aggressive towards each other. Even when a queen from one colony was placed on a nest several hundred metres away, no aggressive response was shown by the workers. This lack of aggression was noted by Elton (1932) studying *F. rufa* in Hampshire and he concluded that although each nest had a distinct territory, there was not normally any hostility between *F. rufa* of different nests.

4.2.1.2 Baiting

Baiting, using different types of food, is a well established method for assessing ant numbers (Tingle 1993, p. 259) and was considered as a possibility for finding colony limits from changes in relative abundance of *F. rufa* on baits.

From April 1994, 20 sugar baits were laid out at 10 m intervals in eight, 200 m long transects from each of two nests (10D and 9H). The sampling interval was partly dependent on the activity level of *F. rufa.* For the periods April 1994 to June 1994, March 1995 to April 1995 and January 1996 to June 1996, sampling interval was fortnightly. Sampling interval was weekly for the periods July 1994 to November 1994 and May 1995 and November 1995. Sampling interval was monthly for December 1994 and January 1995. In August 1994, the number of transects was reduced to one transect per nest in order to monitor the response to sugar. Sugar baits consisted of dental wicks soaked in a 1 M sucrose solution. Sudd and Sudd (1985) found that a concentration of 1 M sucrose solution was necessary to persuade *Formica lugubris* to accept sucrose solution in midsummer in preference to tending aphids.

A number of other baits were tried; a solution of honey, a solution of sucrose, glucose and fructose, tinned tuna and dried cat food.

4.2.1.3 Trails to trees

The direction of trails to trees were used to determine which nest foraged which tree. However, *F. rufa* did not always form distinct trails particularly during the summer when very large numbers of workers near nests produced a "blanket" effect. In such cases it was not possible to assess individual *F. rufa* direction from and to nests.

All trees in the study sites were assessed for numbers of *F. rufa* using a scale of abundance from zero to five based on approximate numbers in trails, passing up and down a fixed point in one minute (Table 4.1). The large numbers of trees sampled necessitated a scale of abundance rather than counting actual numbers. The abundance was recorded for *F. rufa* seen above 1 m from the base of the trunk. Where the tree had multiple main trunks, each trunk was recorded separately. For the groups of saplings, five trees were chosen at random at each sampling and assessed.

Table 4.1: Scale of abundance of *Formica rufa* ascending and descending a tree per minute

Scale of abundance	Corresponding numbers of *F. rufa* passing a fixed point up and down the tree trunk per minute	Visual assessment criteria
0	0	No *F. rufa* seen
1	1 to 5	Undefined trail
2	6 to 10	Single defined trail
3	11 to 30	2 to 3 defined trails
4	31 to 70	4 or 5 trails covering up to half the tree trunk
5	> 70	More than 5 trails covering more than half the tree trunk

4.2.2 Supplementing the food supply

During 1995 and 1996, the food supply to one nest was increased by supplying protein, in the form of tinned tuna, and carbohydrate, in the form of 1 M sucrose solution and honey. One nest at Dimsdale (10D) was chosen to be fed and one nest (1D) was chosen as the control.

Supplementary feeding began on 30th March 1995 as *F. rufa* was beginning to become active. Initially two feeding stations were used. Two upturned plastic slatted crates nailed into the ground 5 m from the nest, on opposite sides, covered a petri dish of tuna

and a 0.25 l of 1 M sucrose solution in each. The sucrose solution was delivered by inverting a pot of sucrose solution onto a pad of cotton wool in a dish. The cotton wool absorbed the solution and *F. rufa* was able to feed from it. The foods were renewed weekly. Unfortunately, these feeding stations were unsatisfactory because of disturbance by dogs, foxes or vandals and after two months their use was discontinued.

In order to stop these problems the tuna was placed in 0.25 l pots covered with 5 mm netting and these were buried 5 cm below the surface of the nest. Each pot contained 150 g of tuna. The tuna was supplied mixed with 0.25 l of 1 M sucrose solution to ensure a continuous supply of carbohydrate. These pots were renewed with fresh food weekly (twice weekly on two occasions in the summer of 1995), if the pots were empty then the amount supplied was increased. In late summer and autumn, not all the tuna was eaten and the amount supplied was decreased; thus the number of pots varied between one and four depending on demand. Any tuna remaining in the pots was emptied out onto the top of the nest. *F. rufa* was observed to take it into the nest. There were still a small number of occasions where the pots were dug up by dogs or foxes, especially in the colder months of the year when *F. rufa* was less active, but this method was a notable improvement over the previous method.

Artificial vitamins were supplied in the form of a crushed tablet (Holland and Barrett own brand one a day multivitamin and mineral tablets) mixed in with the tuna from 30th August 1995. The exact role of vitamins and minerals in the diet is not known, but Bhatkar and Whitcomb (1970) found that if they were left out of their artificial diet none of the 30 species of formicid ants they reared in the laboratory produced sexual forms. The use of a supplement ensured that vitamins and minerals were not a limiting factor.

In 1996, honey was supplied using one feeding station made of a wooden frame with netting around the sides.

4.2.2.1 Grid counts

Fortnightly counts were done from May 1994 to December 1994; monthly counts were done from December 1994 to February 1995, weekly counts from March to November 1995 and fortnightly counts from January 1996 to June 1996 of *F. rufa* using the scale of abundance (Table 4.1) on each tree within the sampling grid around nest 10D (section 3.3.3) and the control nest 1D. In order that assessments on each tree could be compared, counts were done at approximately the same time of day. Wherever possible it was noted from which nest the individual workers were coming from.

4.2.2.2 Quadrats

Between August 1995 and June, 1996 foraging activity on the ground was assessed by counting the total numbers of *F. rufa* seen in a 1 m^2 quadrat. Samples were taken at 10 m intervals over the Dimsdale 1 and 2 grids. For each grid, there were 49 quadrats taken on a 7 by 7 grid with the nest in the centre. The foraging activity of *F. rufa* on the trees within the grid was recorded at the same time as the quadrat samples in order to

examine the relationship between numbers on the ground and numbers ascending and descending trees. The sample dates for Dimsdale are shown in Table 4.2.

Table 4.2: Quadrat sampling dates for Dimsdale

23/08/95
20/09/95
22/11/95
17/01/96
27/03/96
15/05/96
26/06/96

4.2.3 Removing the food supply

One nest at Halse (9H) was chosen and all the trees in a 50 m by 50 m area (with the nest in the middle), which contained all the heavily foraged trees (abundance category 3 and above), were grease-banded. Nest 1H was chosen as the control nest.

During February 1995, loft insulation, 30 cm wide and covered with a layer of clear plastic was wrapped around each tree and secured with nylon string (Figure 4.1). The loft insulation helped to mould the band to the shape of the trunk. During March 1995, the plastic was covered with ICI banding grease, which was reapplied in July 1995 and March 1996. The bands were placed at not less than 1.5 m above the ground, to prevent dogs and small children becoming entangled in the grease.

Figure 4.1: Grease-band around an oak tree in Halse (photograph taken February 1995)

For silver birch and beech this was sufficient to prevent *F. rufa* ascending the trunk. For oak, however, this was less successful because of the many deep crevices in the bark, which *F. rufa* used to ascend the trunk beneath the barrier. Thus the crevices were subsequently filled with fine sawdust and this notably reduced *F. rufa* movement although complete prevention was not achieved.

All trees, however small, needed to be grease-banded because *F. rufa* was able to gain access to the canopy through touching vegetation. In particular, a large patch of rhododendrons caused problems. It proved impossible to stop some individuals of *F. rufa* gaining access to the canopy.

4.2.3.1 Grid counts

Monthly counts were done from December 1994 to February 1995, weekly counts from March to November 1995 and fortnightly counts from January 1996 to June 1996 of *F. rufa* using the scale of abundance (Table 4.1) on each tree within the sampling grid around nest 9H (section 3.3.3) and the control nest 1H. Counts were done at approximately the same time of day each week. Wherever possible it was noted from which nest the individual workers were coming from. For grease-banded trees the foraging activity was recorded above and below the grease-band. The value for above the grease-band has been used for all figures and calculations as this is a representation of the foraging taking place in the tree canopy.

4.2.3.2 Quadrats

The method used is described in section 4.2.2.2. The sampling grids for Halse 1 and 2 were complicated by the presence of roads. The sampling grid and position of the nest is shown in Figure 4.2. Forty quadrats were taken. The sample dates for Halse are shown in Table 4.3.

Figure 4.2: Quadrat sampling grid for Halse 1 and 2

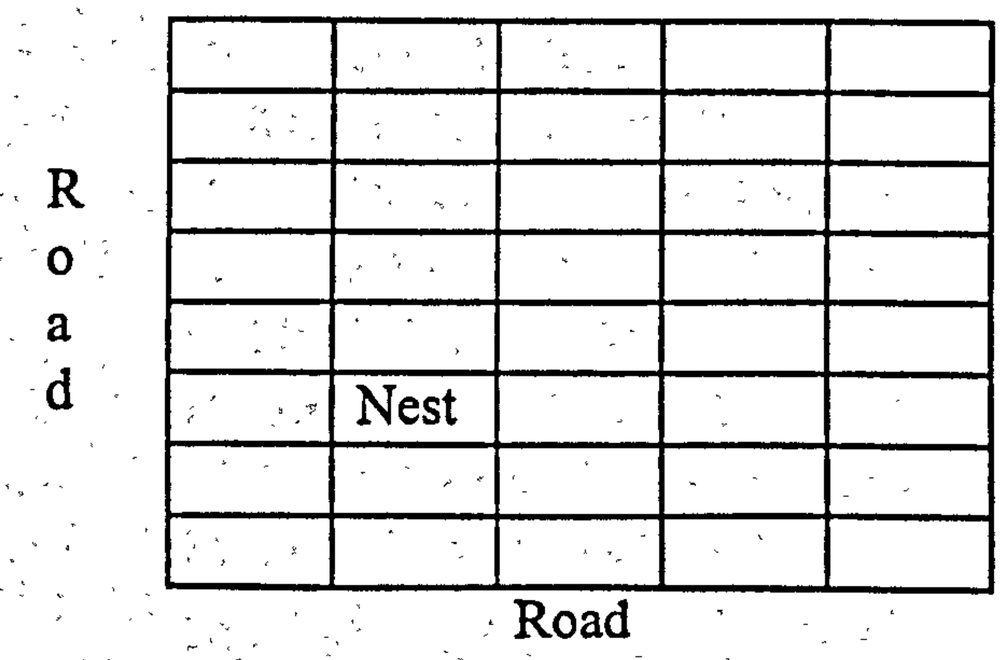


Table 4.3: Quadrat sampling dates for Halse

30/08/95
27/09/95
29/11/95
31/01/96
03/04/96
22/05/96
24/06/96

4.2.4 Whole site counts

From July 1994 to June 1996, activity on a larger scale was also assessed by recording abundance on all the trees within each study site. This involved recording the foraging activity of *F. rufa* on each tree in the study sites using the scale of abundance (Table 4.1). Over 1,500 trees were sampled each time and a team of four or five people was required to ensure that all the trees were examined on the same day. Where possible each person assessed the same set of trees at each examination. Counts started at about 10 am and concluded at about 4 pm. The air temperature was noted at the beginning and the end of each study site count. Counts were not started earlier because during colder months the air temperature, and therefore *F. rufa* activity, was very low. The counts were done at approximately the same time so results could be compared. The direction from which *F. rufa* was coming (north, north-east etc.) was also recorded to aid in identifying the foraging area of each nest. No counts were done during the winter months due to the inactivity of *F. rufa*. The sample dates are show in Table 4.4 for Dimsdale and Table 4.5 for Halse. The trees were initially labelled over several days and the first record of foraging abundance was done at the same time. Therefore the first date for foraging abundance is a combination of values from different days. For Dimsdale, the trees were labelled on the 1st, 4th, 9th, 10th and 18th August 1994 and for Halse on the 27th and 29th July 1994.

Table 4.4: Sample dates for whole site foraging abundance on trees in Dimsdale from 1994 to 1996

08/94
07/09/94
12/04/95
24/05/95
19/07/95
06/09/95
15/11/95
17/04/96
24/06/96

Table 4.5: Sample dates for whole site foraging abundance on trees in Halse from 1994 to 1996

07/94
16/08/94
12/04/95
24/05/95
19/07/95
06/09/95
15/11/95
17/04/96
24/06/96

4.2.5 Sexual production

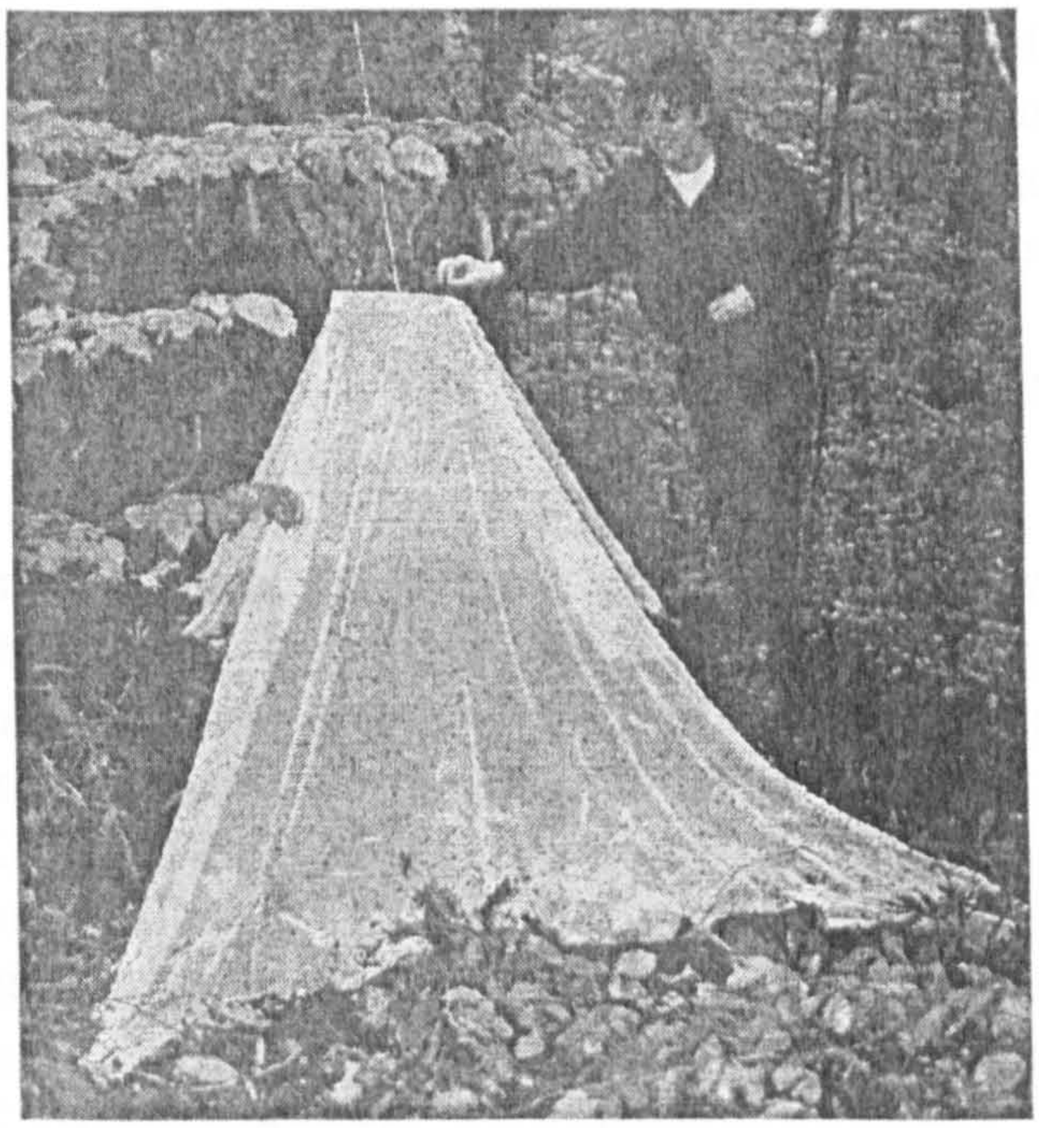
Sexual production was assessed during 1995 by recording the number of male and female alatae present on 10th and 31st May on the surface of all nests within the study sites.

In 1996, a more comprehensive survey of the sexual production of the main nests was attempted using sticky traps.

Yellow sticky traps (Bio Greenhouse Fly Catcher, Pan Britannica Industries Ltd) were tied to 1 m bamboo canes using twist ties and inserted into the centre of each nest so the sticky trap hung vertically just above the surface. The traps, 10 cm by 25 cm, were sticky on both sides. The cane was greased with fruit tree grease (Vitax Ltd) to prevent workers from ascending it. All nests in both study sites had one such sticky trap except 12D and 7H which had two because the nest surfaces were much larger than the others. The sticky traps were put out between 14th and 25th May 1996. Numbers and sex of trapped alatae and those seen on the nest were recorded regularly.

From the 26th to 28th May, the estimated main emergence period, the nests were netted in order to try and catch the maximum number of alatae. Four mm diameter micro netting (House and Company) was placed over each nest. Enough was used to completely enclose the nest. This was only possible for a short period of time due to the great disturbance caused to the workers. For nests in large tree stumps, the whole stump was enclosed. The base of the netting was buried in the ground and secured at four corners by 15 cm nails. On the inside, in the centre of the netting was a piece of cardboard (20 cm by 20 cm), covered with clear plastic and coated on one side with ICI banding grease. Through the centre of the cardboard was a length of nylon string which was then secured to the nearest available point, for example, the branch of tree. This kept the netting and the grease off the surface of the nest (Figure 4.3). The greased area was the highest point in the enclosed area. Numbers and sex of trapped alatae and those seen on the nest were recorded daily.

Figure 4.3: Netting a *Formica rufa* nest to trap emerging alatae (photograph taken May 1996)



From the 30th May to 4th June, after the netting had been removed, sticky traps were used to catch emerging alatae. The traps were rectangles of cardboard (46 cm long by 33 cm wide) covered with clear plastic coated with ICI banding grease on one side. Two 75 cm flower sticks (Garden Ware) were inserted between the cardboard layers, one on each side, to support the trap leaving 20 cm protruding. The protruding sticks were then buried into the surface of the nest. All traps were placed with the sticky side facing north. Numbers and sex of trapped alatae and those seen on the nest were recorded regularly. The sticky traps were taken down on the 4th June as no further alatae were seen on the surfaces of the nests.

4.3 Results

4.3.1 Baiting

The change in mean number of *F. rufa* per sugar bait for the transect from Dimsdale nest 10D throughout the study period is shown in Figure 4.4, the data is shown in Appendix A. The median value for the trees in the 50 by 50 m^2 grids surrounding nest 10D at Dimsdale are shown for comparison. The sharp fall in numbers gathering at sugar baits at the beginning of June is clearly visible in 1994, 1995 and 1996, as is the subsequent rise in numbers gathering in late August to November. Foraging on trees remains consistently high throughout June, July and August. This pattern is consistent between years. The sugar baiting at Halse showed a similar pattern to Dimsdale. The data is shown in Appendix A and the results are presented in Figure 4.5. The median

values for the trees around nest 9H are not plotted due to the disruption caused by grease-banding. The reduction in availability of honeydew caused by the grease-banding had no effect on the numbers gathering at baits.

Other results are not presented as the method was not successful in showing changes in colony boundaries due to *F. rufa* not gathering at baits during June, July and August. Of the other baits tried, the solution of honey and solution of sucrose, glucose and fructose were no more attractive to *F. rufa* than 1 M sucrose solution. Tinned tuna and dried cat food were attractive when sucrose solution was not.

4.3.2 Supplementing the food supply

The amount of food supplied varied with the time of year and was supplied on the basis that there was always a continuous surplus of both protein and carbohydrate. Approximately 13 kg of tinned tuna (54,860 kJ, energy value taken from tin), 11.25 l of 1 M sucrose solution (65,407.5 kJ, energy value taken from packet) and 12 vitamin tablets was supplied over the period 30th March to 29th November 1995. From 20th March to 26th June 1996, 1.5 kg of tinned tuna was supplied (6,330 kJ), 2.25 l of 1 M sucrose solution (13,081.5 kJ), 950 g of honey (13,404.5 kJ) and 10 vitamin tablets. Over the whole study period 153,083.5 kJ were supplied. Pots disturbed by other animals were not counted as being eaten by *F. rufa*.

4.3.2.1 Grid counts

General observations showed foraging began in 1994 between 4th and 21st March. The frequent grid counts indicate the onset of foraging in 1995 as between 8th and 22nd March and in 1996 as between 27th March and 3rd April. Foraging in 1994 had ceased by 9th December and was almost zero in 1995 by 29th November. Monitoring stopped in 1996 on 26th June. The full results for Dimsdale grids 1 and 2 are shown in Appendix B. Seasonal change in the foraging activity of *F. rufa* can be seen in the change in medians, upper and lower quartiles for different tree species. Figure 4.6 to Figure 4.11 show the changes in median values for beech, oak, and silver birch trees for Dimsdale grid 1 and Dimsdale grid 2.

The winter period of inactivity for 1994/1995 and 1995/1996 shows up very clearly, as does the sharp increase in activity in the spring of 1995 and 1996, within a week of the onset of foraging. On beech, there is little fluctuation in foraging activity throughout the summer of 1995, except for a brief increase in July where there is a corresponding decrease in foraging activity on oak. Foraging on beech is low from August 1994 in both grids. Interestingly, foraging activity on beech for grid 1 is maintained through the summer of 1995 and well into the autumn, whereas foraging activity in grid 2 drops in August at the same time as in 1994. Foraging activity on silver birch peaked in June and July of 1994 and 1995, peaks in activity were higher in grid 2 compared to grid 1.

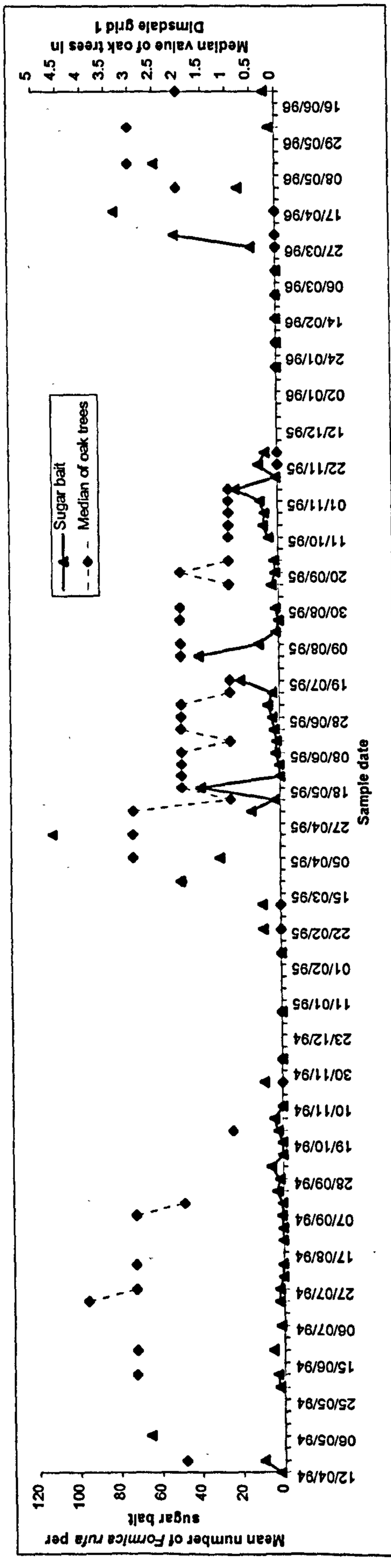


Figure 4.3: Mean number of *Formica rufa* per sugar bait and the median values for oak trees in Dimsdale grid 1 for 1994 to 1996

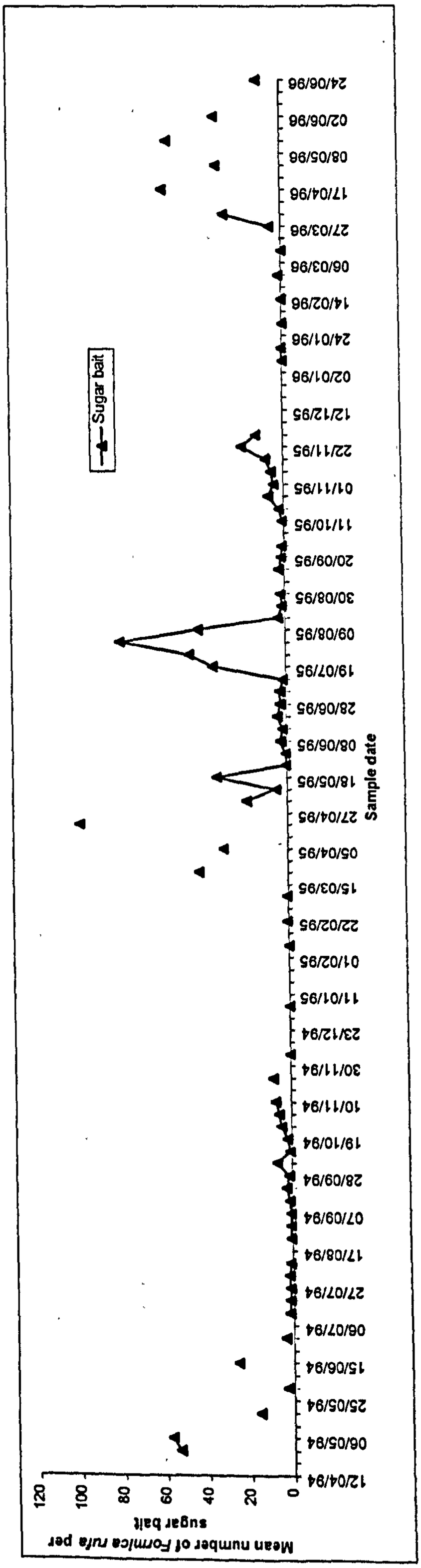


Figure 4.5: Mean number of *Formica rufa* per sugar bait at Halse for 1994 to 1996

Figure 4.4: Mean number of *Formica rufa* per sugar bait and the median values for oak trees in Dimsdale grid 1 for 1994 to 1996

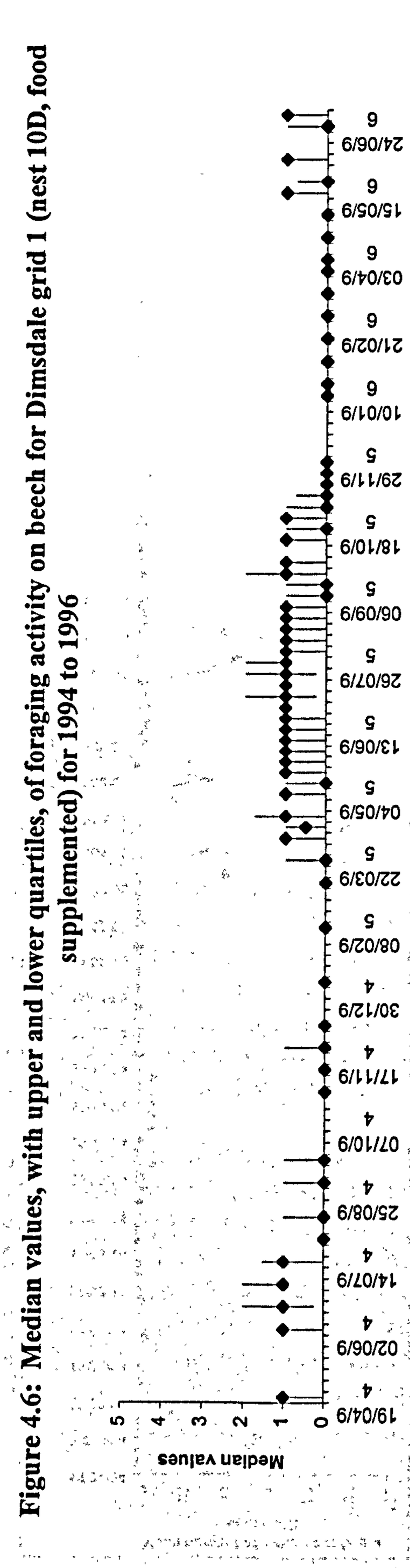


Figure 4.6: Median values, with upper and lower quartiles, of foraging activity on beech for Dimsdale grid 1 (nest 10D, food supplemented) for 1994 to 1996

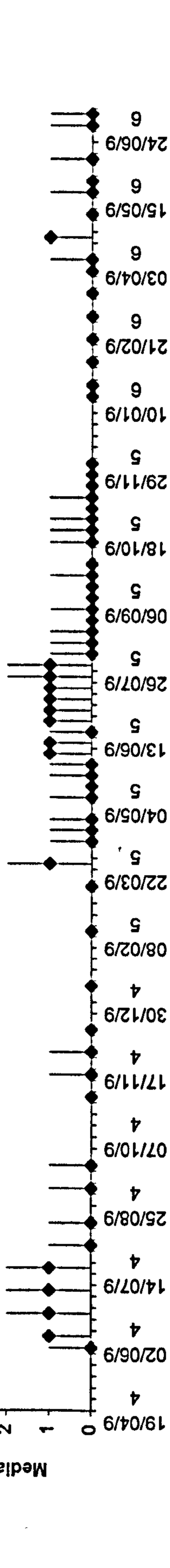


Figure 4.7: Median values, with upper and lower quartiles, of foraging activity on beech for Dimsdale grid 2 (nests 1D-6D, control) for 1994 to 1996

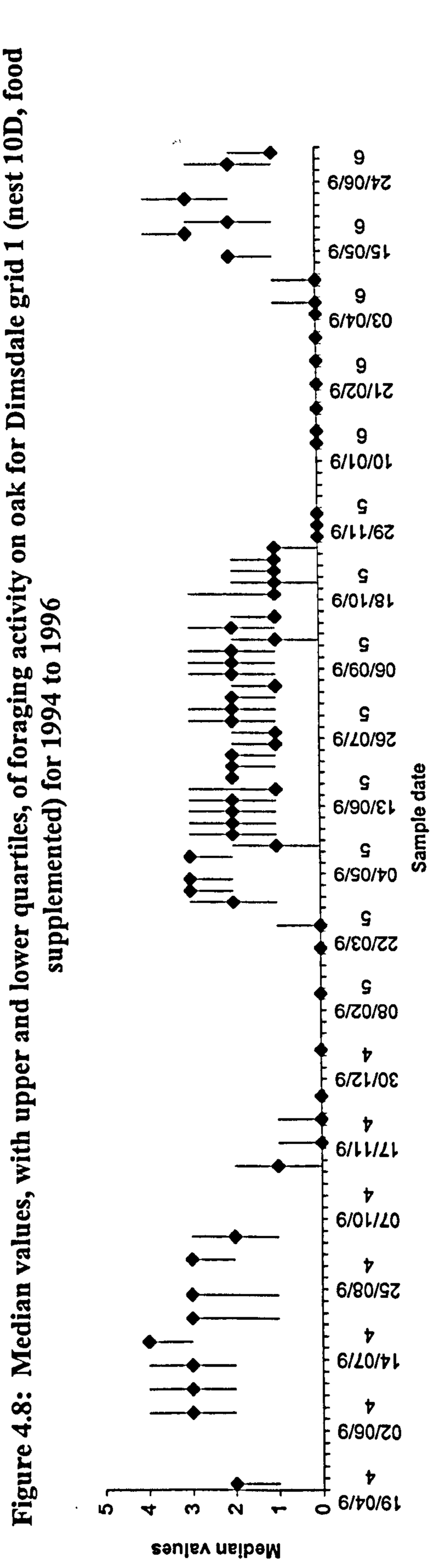


Figure 4.8: Median values, with upper and lower quartiles, of foraging activity on oak for Dimsdale grid 1 (nest 10D, food supplemented) for 1994 to 1996

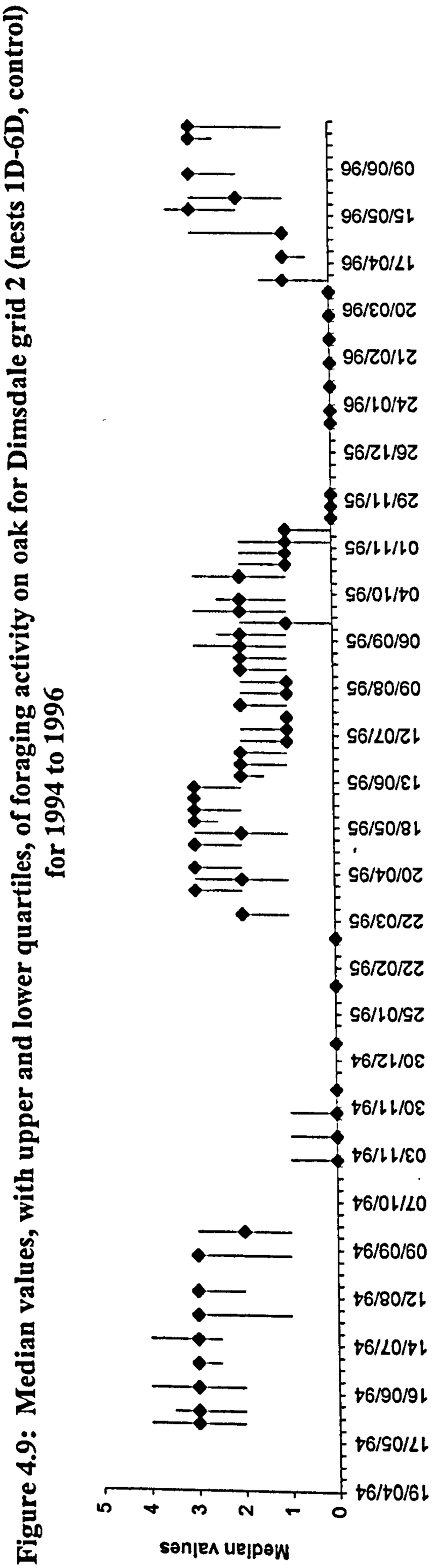


Figure 4.9: Median values, with upper and lower quartiles, of foraging activity on oak for Dimsdale grid 2 (nests 1D-6D, control) for 1994 to 1996

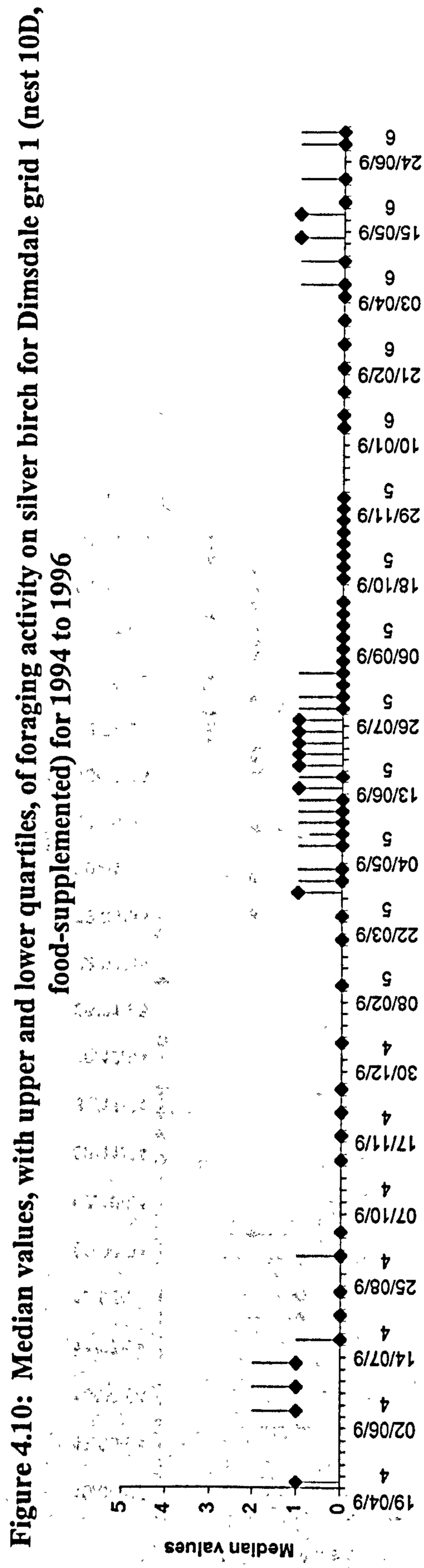


Figure 4.10: Median values, with upper and lower quartiles, of foraging activity on silver birch for Dimsdale grid 1 (nest 10D, food-supplemented) for 1994 to 1996

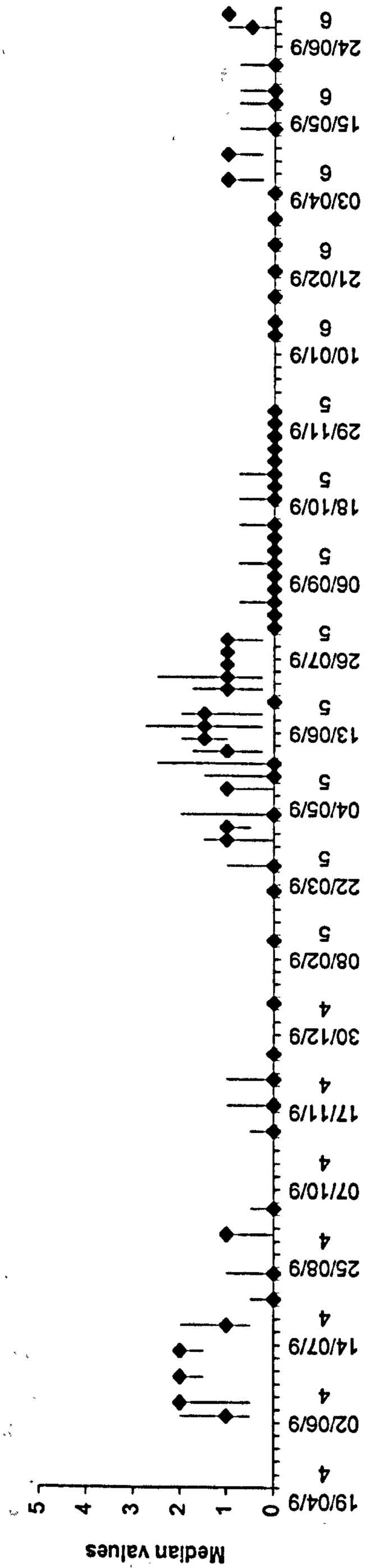


Figure 4.11: Median values, with upper and lower quartiles, of foraging activity on silver birch for Dimsdale grid 2 (nests 1D-6D, control) for 1994 to 1996

Foraging on different tree species within the grids can be represented as a percentage of available trees (the number of trees available for each species is the same for every sampling occasion). Figure 4.12 for Dimsdale grid 1 and Figure 4.13 for Dimsdale grid 2, show how the percentage of available trees heavily foraged (abundance category 3 and above) changes through the study period. Oak was consistently heavily foraged in preference to beech and silver birch. The only exception being July 1995, when heavy foraging on oak dropped and heavy foraging on beech increased. A much smaller fall occurred at approximately the same period in 1994, but there was no corresponding rise of heavy beech foraging. After the decrease in 1995, heavy foraging on oak did not seem to return to higher values (compared with 1994). In Dimsdale grid 2 silver birch showed heavy foraging activity early in the season in 1994 and 1995 (April to July), after which activity was low for the rest of the season. In Dimsdale grid 1, activity on silver birch was generally lower in comparison to Dimsdale grid 2, with the main activity seen in April to July. Some activity was seen in 1996.

From the sampling results, the number of times each tree is recorded as foraged can be presented as a percentage of the total number of possible times it could have been foraged i.e. total number of sampling occasions (April to September). Percentages for just heavily foraged trees (category 3 and above) can be calculated in order to investigate whether such trees were consistently foraged at that rate. Such percentages can also be calculated for trees in different girth categories in order to investigate whether larger trees were foraged more often than smaller trees. Trees were assigned to one of three categories: small (girth <0.7 m), medium (girth 0.7 m to 1.4 m) and large (girth >1.4 m). These size categories gave approximately equal numbers of trees in each category.

The graphs (Figure 4.14 to Figure 4.21) show a gradation of foraging effort with large trees consistently foraged more often than smaller trees. There is a wide variation, but oaks were foraged more consistently than beeches. For abundance category 1 or above, all large oaks showed almost continuous foraging (91 - 100 % of available times). In comparison, there was a much greater spread of foraging effort on large beeches. Similarly, more large oaks were heavily foraged (abundance category 3 or above) than beeches, and showed more consistent foraging. The overall pattern is the same for Dimsdale grids 1 and 2.

Figure 4.12: Graph of percentages of available beech, oak and silver birch trees foraged with abundance category 3 or above in Dimsdale grid 1

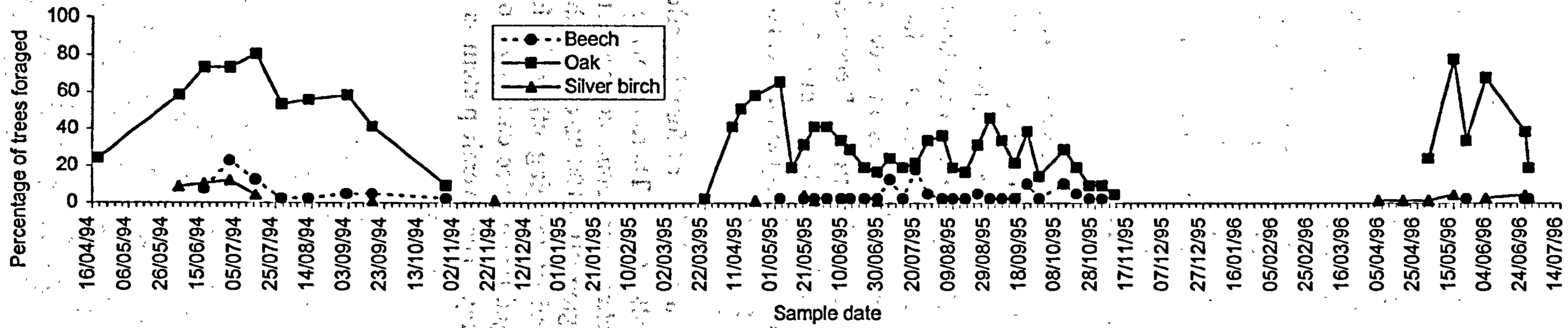


Figure 4.13: Graph of percentages of available beech, oak and silver birch trees foraged with abundance category 3 or above in Dimsdale grid 2

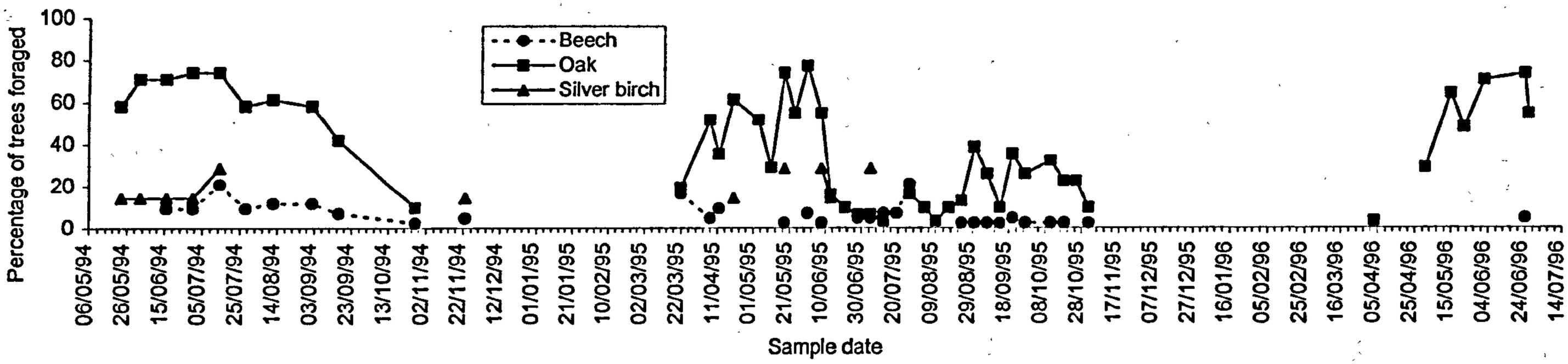


Figure 4.14: Constancy of foraging on different sized beech trees for abundance category 1 or above during the period April to September for 1994 to 1996 for Dimsdale grid 1

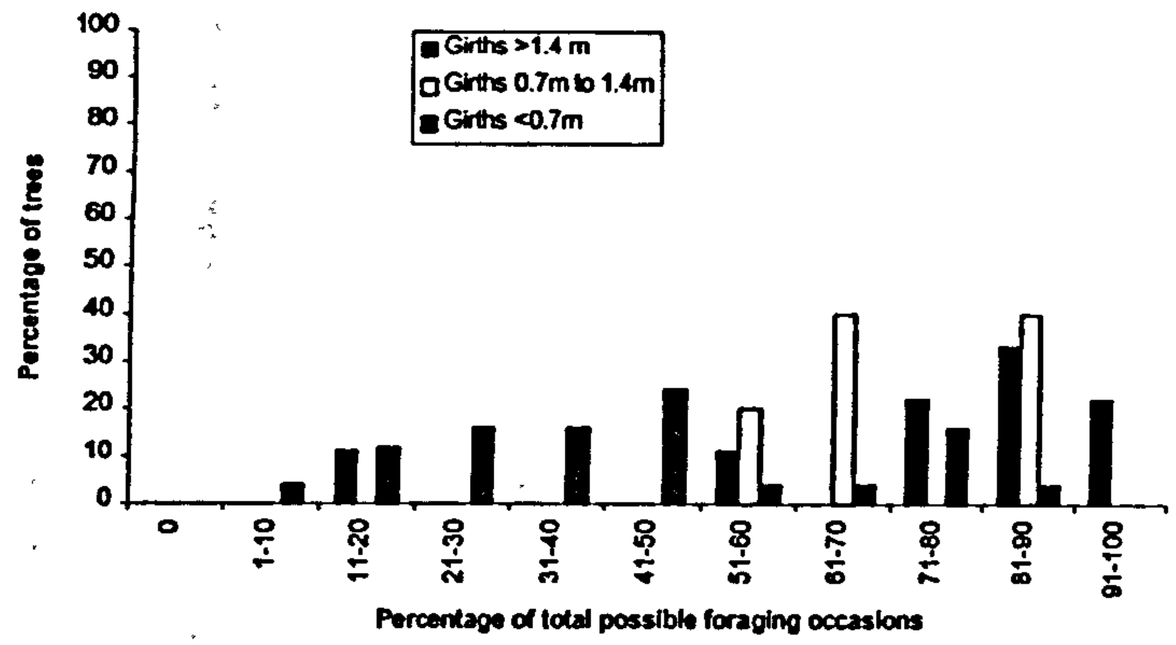


Figure 4.15: Constancy of foraging on different sized beech trees for abundance category 3 or above during the period April to September for 1994 to 1996 for Dimsdale grid 1

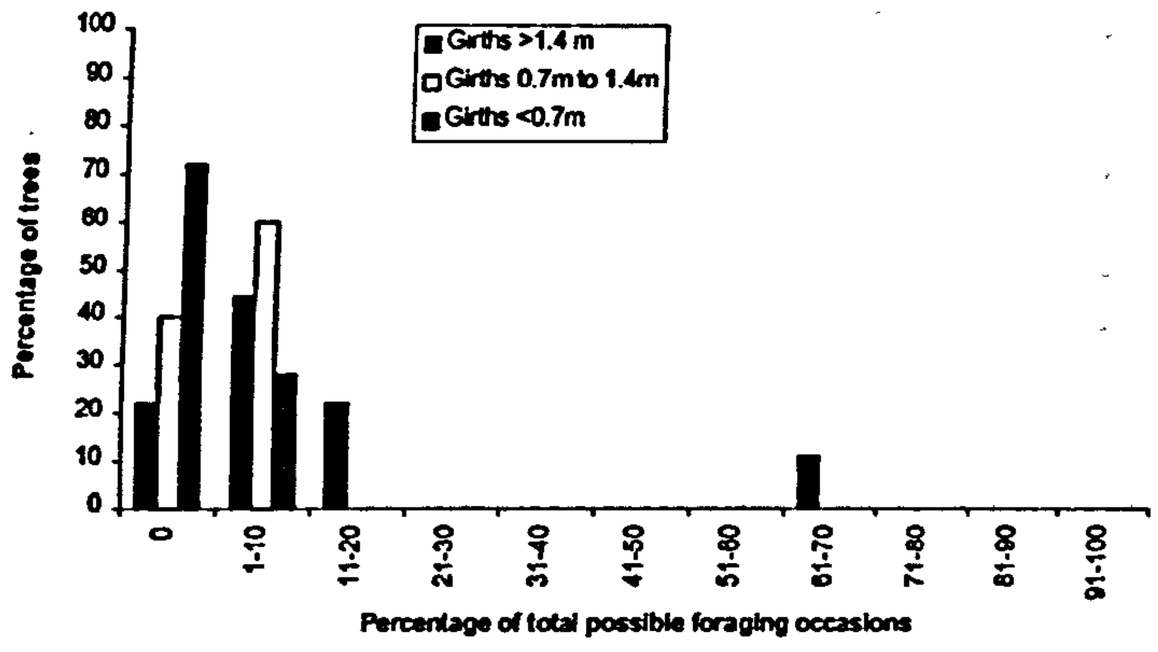


Figure 4.16: Constancy of foraging on different sized beech trees for abundance category 1 or above during the period April to September for 1994 to 1996 for Dimsdale grid 2

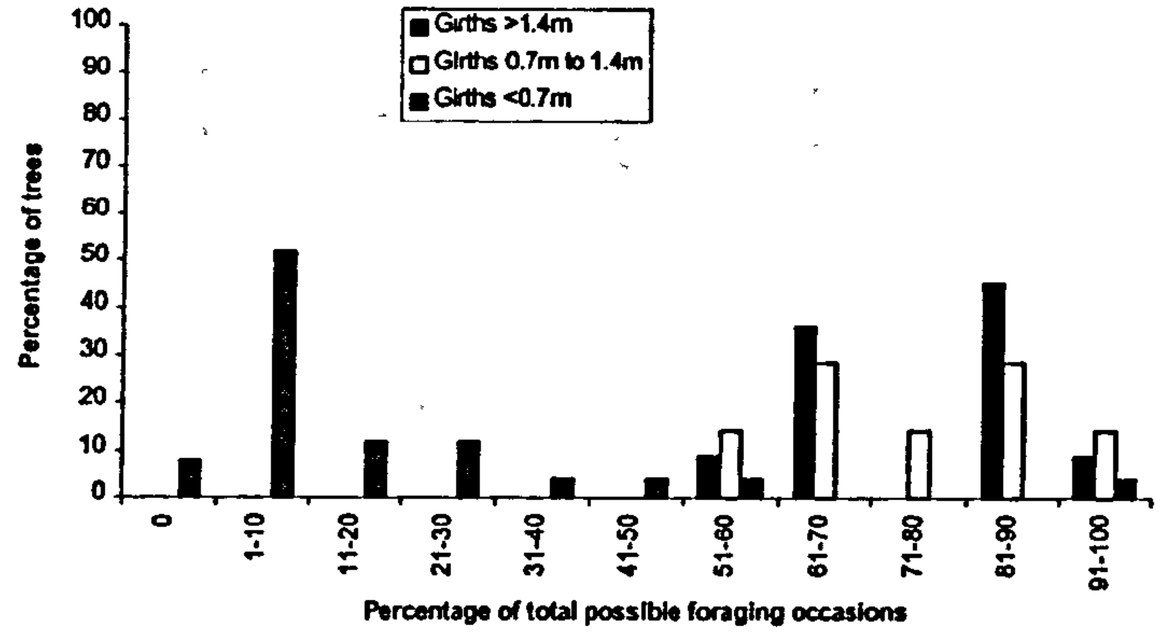


Figure 4.17: Constancy of foraging on different sized beech trees for abundance category 3 or above during the period April to September for 1994 to 1996 for Dimsdale grid 2

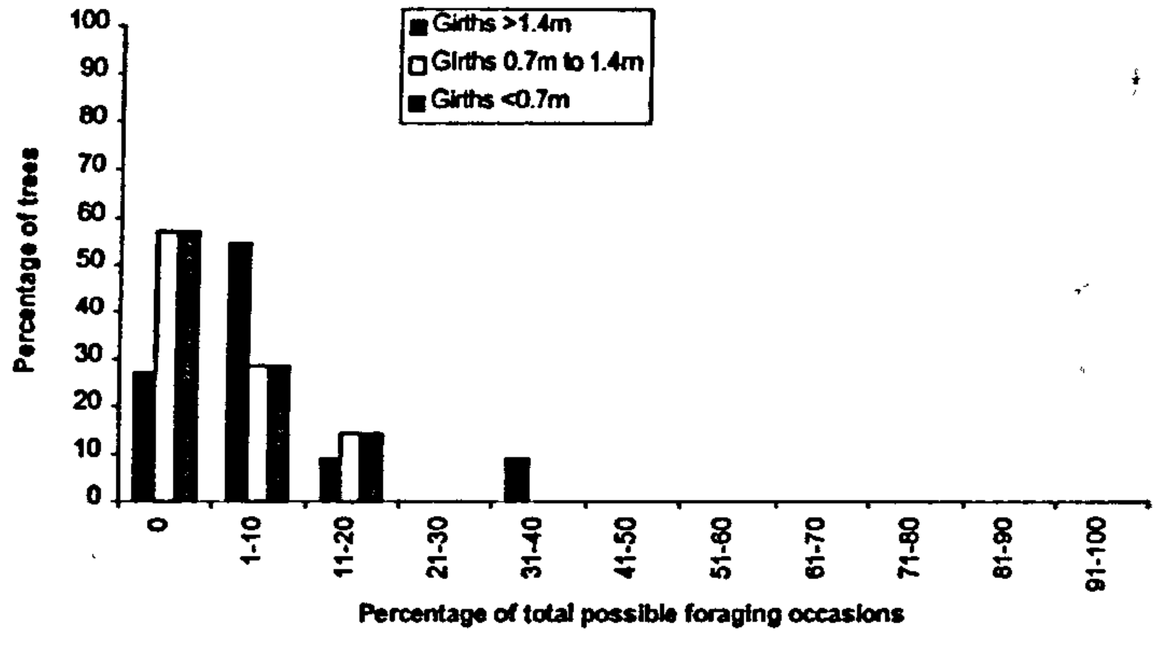


Figure 4.18: Constancy of foraging on different sized oak trees for abundance category 1 or above during the period April to September for 1994 to 1996 for Dimsdale grid 1

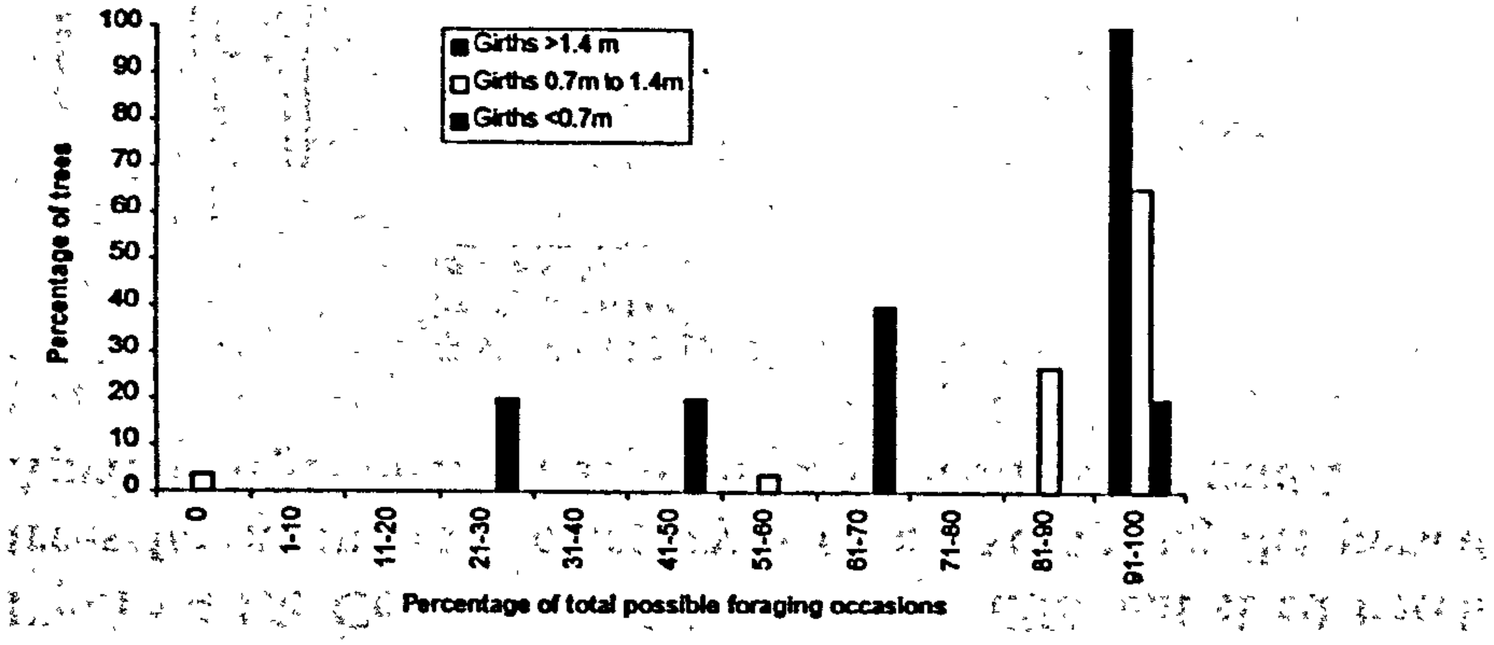


Figure 4.19: Constancy of foraging on different sized oak trees for abundance category 3 or above during the period April to September for 1994 to 1996 for Dimsdale grid 1

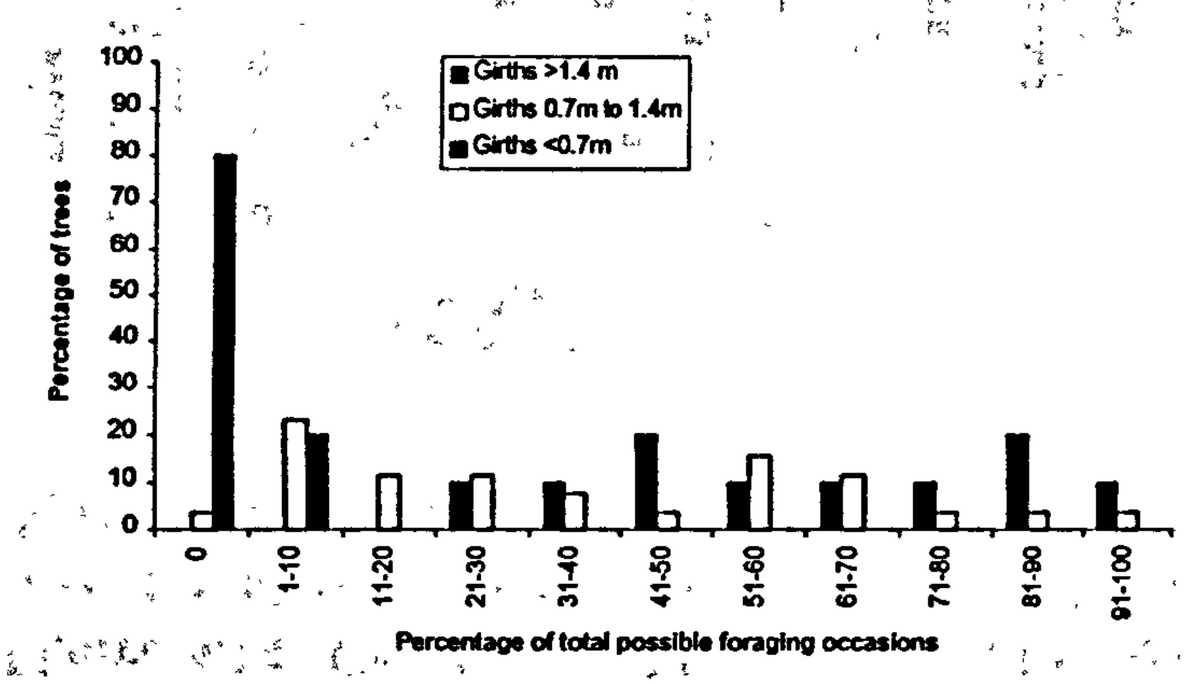


Figure 4.20: Constancy of foraging on different sized oak trees for abundance category 1 or above during the period April to September for 1994 to 1996 for Dimsdale grid 2

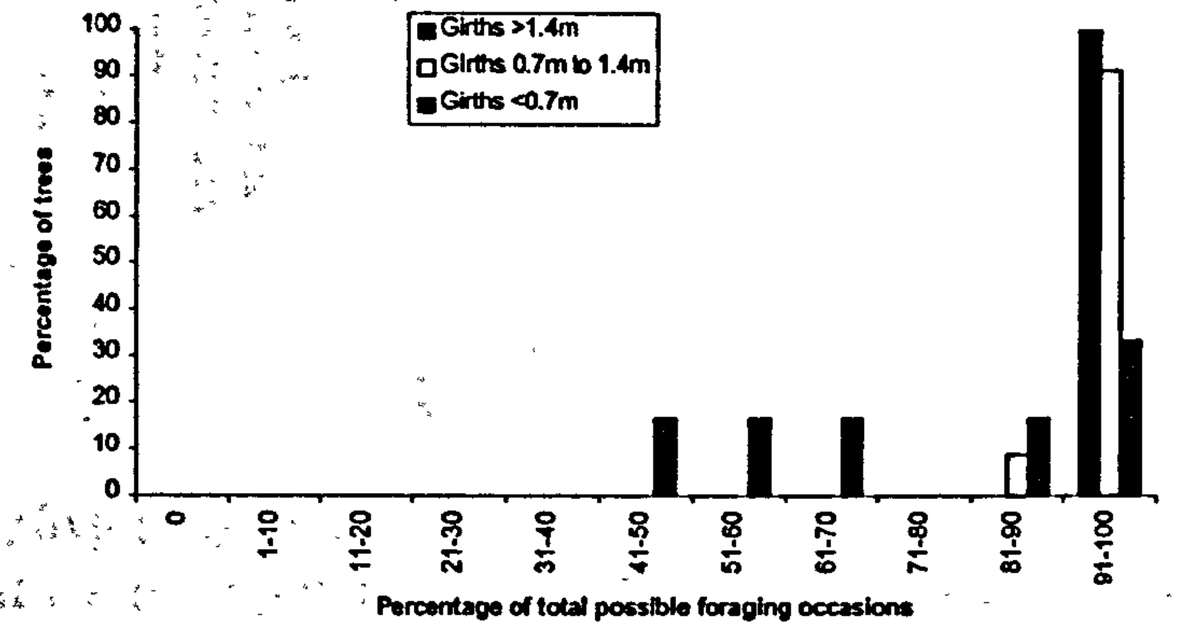
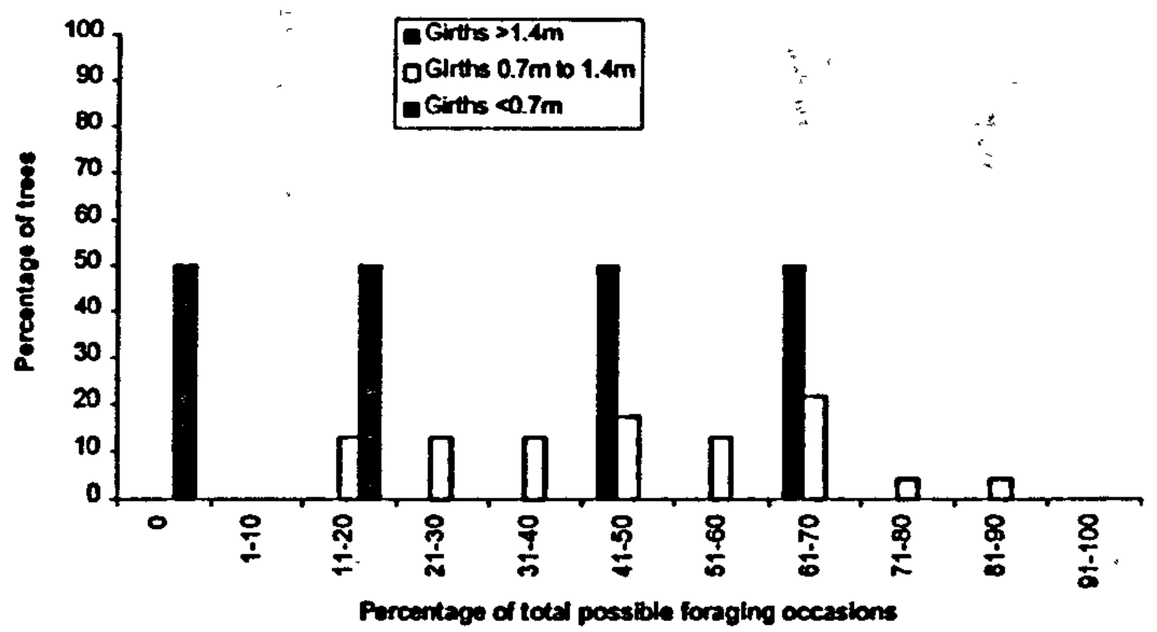


Figure 4.21: Constancy of foraging on different sized oak trees for abundance category 3 or above during the period April to September for 1994 to 1996 for Dimsdale grid 2



For cases in which trees are almost constantly foraged, for example oaks foraged at category 1 or above, then it will always be the same trees foraged in different years. For cases in which the constancy of foraging is less, the constancy of foraging does not show whether there is a tendency for the same trees to be foraged in different years or whether there is variation from year to year. Table 4.6 to Table 4.9 show the numbers of trees repetitively foraged in the same month (April to September) in different years.

The numbers of trees repetitively foraged in the same month (April to September) in different years was calculated. Table 4.6 and Table 4.7 show how many of the beech trees were foraged in the same month in combinations of years for Dimsdale grids 1 and 2. Table 4.8 and Table 4.9 show how many oaks were foraged repetitively for Dimsdale grids 1 and 2. To determine whether the same trees tended to be foraged, it is necessary to adjust for the variability in foraging effort in the different years. For instance, April 1995 was a lot warmer than April 1996, and therefore there was a lot more foraging in the former year. In order to determine whether the same trees tended to be foraged in the same month in different years, it is therefore necessary to ask whether the foraged trees in the less favourable month were also foraged in the more favourable month. If they were, this would indicate that there was a core of trees that tended to be foraged, with additional trees being foraged in more favourable conditions. In the tables, the number in brackets is the percentage of the lowest number of common trees. For example, in April 1995 34 beech trees were foraged with abundance category 1 or above in Dimsdale grid 1 and in April 1996 there were 13. However, only 11 were common to both years, 85 % of the 13 which could have been common to the two years. The results show that fidelity of foraging on oak trees is extremely high, often 100 %, for abundance category 1 or above and 3 or above. Fidelity on beech trees is high for abundance category 1 or above and although often high for abundance category 3 or above, the actual numbers of trees involved are very small, typically one or two.

Table 4.10 shows the percentage of beech and oak trees continuously foraged during 1994 (June to September), 1995 (April to September) and 1996 (May to September) for Dimsdale grid 1 and Table 4.11 for Dimsdale grid 2. Continuous foraging on beech is very low (a maximum of 5 %) for abundance category 1 or above and zero for heavy foraging (abundance category 3 or above). Up to 33 % of oak trees were continuously foraged for abundance category 1 or above and for heavy foraging (abundance category 3 or above) a maximum for 16 % was recorded. The high percentages of continuous foraging on oak trees reflect their importance as the host plant of the major honeydew producing aphid *L. roboris*.

Table 4.6: Number of beech trees foraged repetitively in a month (percentage of common trees), April to September for 1994, 1995 and 1996 for Dimsdale grid 1

Number of available trees = 38

	Abundance category 1 or above						Abundance category 3 or above					
	April	May	June	July	August	September	April	May	June	July	August	September
94	22	-	34	27	17	21	0	-	9	5	1	3
95	34	35	36	37	30	29	0	1	1	7	2	4
96	13	23	32	-	-	-	0	1	1	-	-	-
94-95-96	7 (54)	-	28 (88)	-	-	-	0	-	1 (100)	-	-	-
94-95	19 (86)	-	32 (94)	26 (96)	15 (88)	19 (90)	0	-	1 (100)	2 (40)	1 (100)	1 (33)
94-96	9 (69)	-	29 (91)	-	-	-	0	-	1 (100)	-	-	-
95-96	11 (85)	23 (100)	30 (94)	-	-	-	0	0	1 (100)	-	-	-

Table 4.7: Number of beech trees foraged repetitively in a month (percentage of common trees), April to September in 1994, 1995 and 1996 for Dimsdale grid 2

Number of available trees = 43

	Abundance category 1 or above						Abundance category 3 or above					
	April	May	June	July	August	September	April	May	June	July	August	September
94	-	18	35	26	15	16	-	0	5	9	5	6
95	23	28	32	32	24	21	6	3	2	10	1	2
96	26	23	24	-	-	-	0	0	2	-	-	-
94-95-96	-	15 (83)	22 (92)	-	-	-	-	0	0	-	-	-
94-95	-	16 (89)	27 (84)	25 (96)	13 (87)	14 (88)	-	0	1 (50)	7 (78)	1 (100)	1 (50)
94-96	-	16 (89)	23 (96)	-	-	-	-	0	1 (50)	-	-	-
95-96	22 (96)	21 (91)	23 (96)	-	-	-	0	0	0	-	-	-

Table 4.8: Number of oak trees foraged repetitively in a month (percentage of common trees), April to September in 1994, 1995 and 1996 for Dimsdale grid 1

Number of available trees = 41

	Abundance category 1 or above						Abundance category 3 or above					
	April	May	June	July	August	Sept.	April	May	June	July	August	Sept.
94	38	-	41	38	37	40	10	-	31	33	23	24
95	40	41	41	40	38	38	27	29	17	16	20	18
96	21	41	41	-	-	-	0	32	29	-	-	-
94-95-96	21(100)	-	41(100)	-	-	-	0	-	15 (88)	-	-	-
94-95	37 (97)	-	41(100)	38(100)	36 (97)	37 (97)	10(100)	-	16 (94)	16(100)	18 (90)	18 (100)
94-96	21(100)	-	41(100)	-	-	-	0	-	27 (93)	-	-	-
95-96	21(100)	41(100)	41(100)	-	-	-	0	27 (93)	16 (94)	-	-	-

Table 4.9: Number of oak trees foraged repetitively in a month (percentage of common trees), April to September in 1994, 1995 and 1996 for Dimsdale grid 2

Number of available trees = 31

	Abundance category 1 or above						Abundance category 3 or above					
	April	May	June	July	August	Sept.	April	May	June	July	August	Sept.
94	-	30	31	31	28	29	-	18	25	23	19	18
95	31	31	31	31	29	29	21	28	17	6	12	16
96	25	31	31	-	-	-	1	22	25	-	-	-
94-95-96	-	30(100)	31	-	-	-	-	15 (83)	16 (94)	-	-	-
94-95	-	30(100)	31(100)	31(100)	28(100)	27 (93)	-	18(100)	16 (94)	6 (100)	12(100)	14 (88)
94-96	-	30(100)	31(100)	-	-	-	-	15 (83)	23 (92)	-	-	-
95-96	25(100)	31(100)	31(100)	-	-	-	1 (100)	22(100)	17(100)	-	-	-

Table 4.10: Percentage of beech and oak trees continuously foraged in 1994, 1995 and 1996 for Dimsdale grid 1

% of trees continuously foraged	Abundance category 1 or above			Abundance category 3 or above		
	1994	1995	1996	1994	1995	1996
Beech	4	2	2	0	0	0
Oak	31	14	33	16	1	3

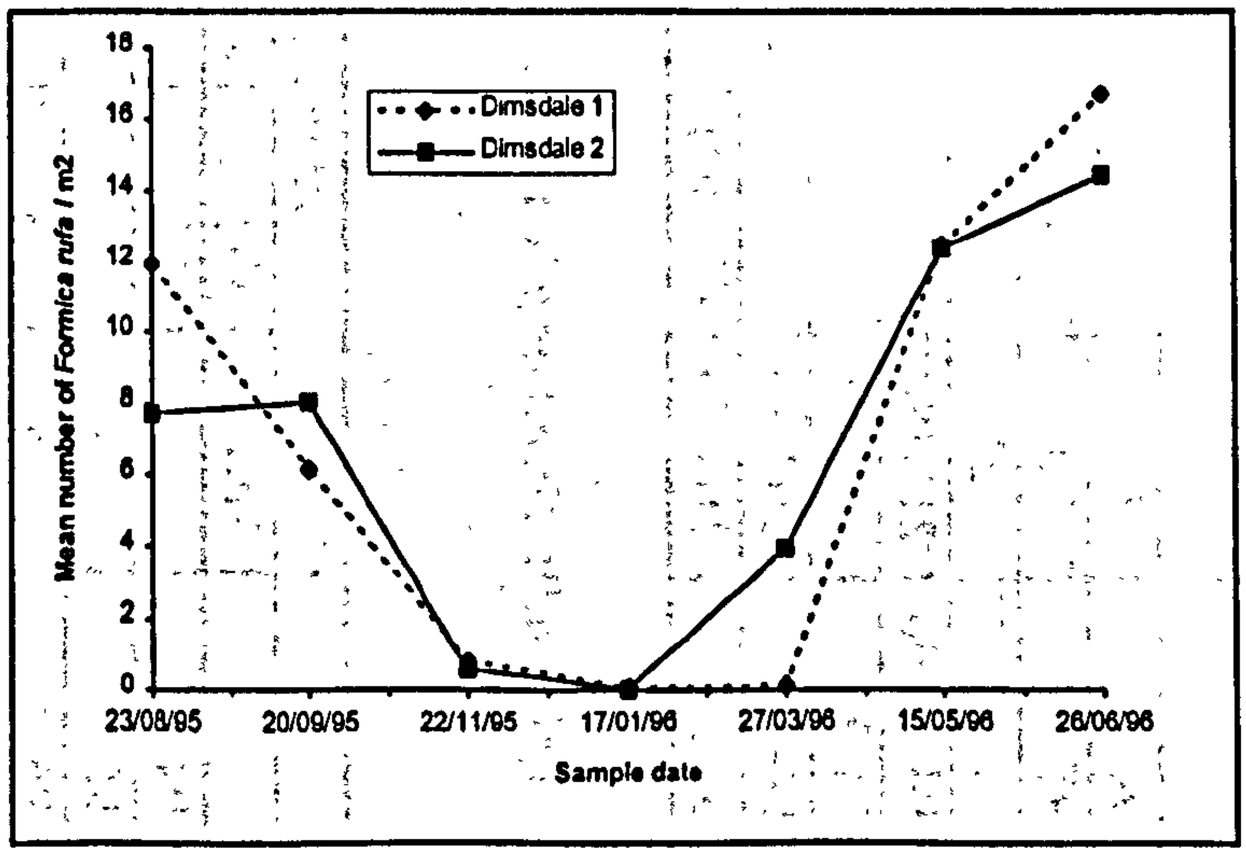
Table 4.11: Percentage of beech and oak trees continuously foraged in 1994, 1995 and 1996 for Dimsdale grid 2

% of trees continuously foraged	Abundance category 1 or above			Abundance category 3 or above		
	1994	1995	1996	1994	1995	1996
Beech	5	2	2	0	0	0
Oak	27	14	25	12	0	6

4.3.2.2 Quadrats

The mean number of *F. rufa* per m^2 for each sample date is shown in Figure 4.22. The data is shown in Appendix C. As expected it shows a decrease from the summer of 1995 to zero in the winter and an increase from spring 1996. The pattern in grid 1 is highly correlated (Pearson product-moment correlation coefficient) with the pattern in grid 2 (r=0.93, $p<0.001$); supplementary feeding of nest 10D has not affected the number of foragers.

Figure 4.22: Mean quadrat values for Dimsdale grids 1 (nest 10D) and 2 (nests1D-6D) for 1995 to 1996



4.3.3 Removing the food supply

As mentioned in section 4.2.3, it was impossible to totally exclude *F. rufa* from foraging in grease-banded trees, particularly oak.

4.3.3.1 Grid counts

General observation showed foraging began in 1994 between 4th and 21st March. The frequent grid counts indicate the onset of foraging in 1995 as between 8th and 22nd March and in 1996 as between 27th March and 3rd April. Foraging in 1994 had ceased by 9th December and was almost zero in 1995 by 29th November. Monitoring stopped in 1996 on 26th June. Seasonal change in the foraging activity of *F. rufa* can be seen in the change in medians, upper and lower quartiles for different tree species (Figure 4.23 to Figure 4.28). The data is shown in Appendix D.

The winter period of inactivity for 1994/1995 and 1995/1996 shows up very clearly, as does the sharp increase in activity in the spring of 1995 and 1996, within a week of the onset of foraging. On beech, there is little fluctuation in foraging activity throughout the summer of 1995, except for a brief increase in July where there is a corresponding decrease in foraging activity on oak. From the end of July 1995, the grease-banding on beech at Halse grid 2 is completely successful. Grease-banding on oak was less successful. Some high values were seen in April and May 1995 whilst initial problems with the grease-bands were sorted out. Overall median values for Halse grid 2 in 1995 were low compared with Halse grid 1, showing the grease-banding reduced foraging activity. Not all the silver birch and miscellaneous trees (all the rest of the tree species present at the site, see Table 3.7 for details) in Halse grid 2 were grease-banded and foraging activity throughout the study period is similar in both sites.

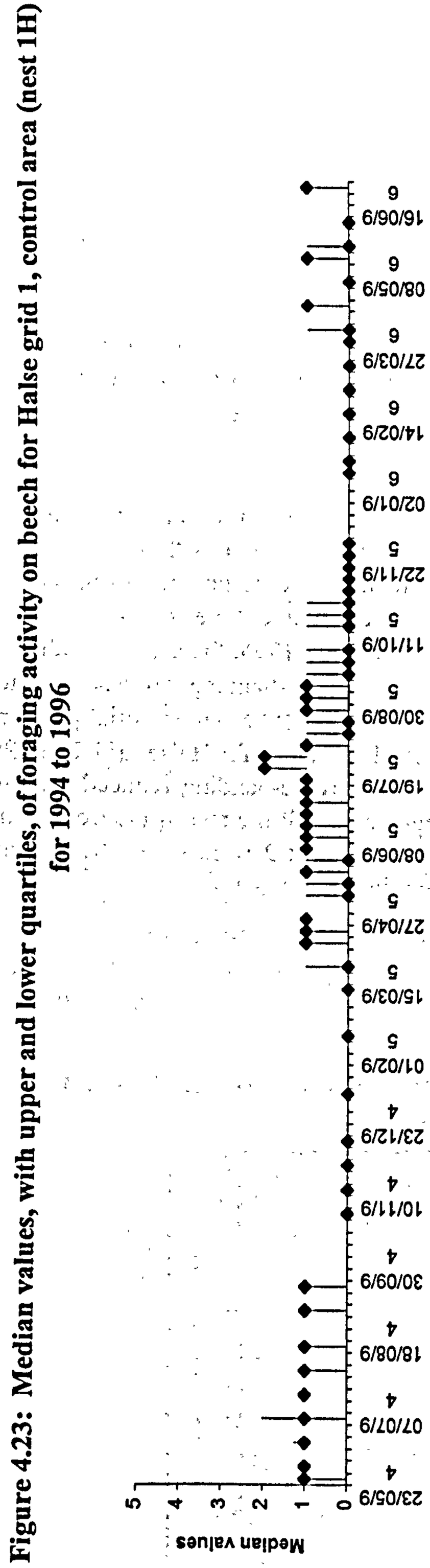


Figure 4.23: Median values, with upper and lower quartiles, of foraging activity on beech for Halse grid 1, control area (nest 1H) for 1994 to 1996

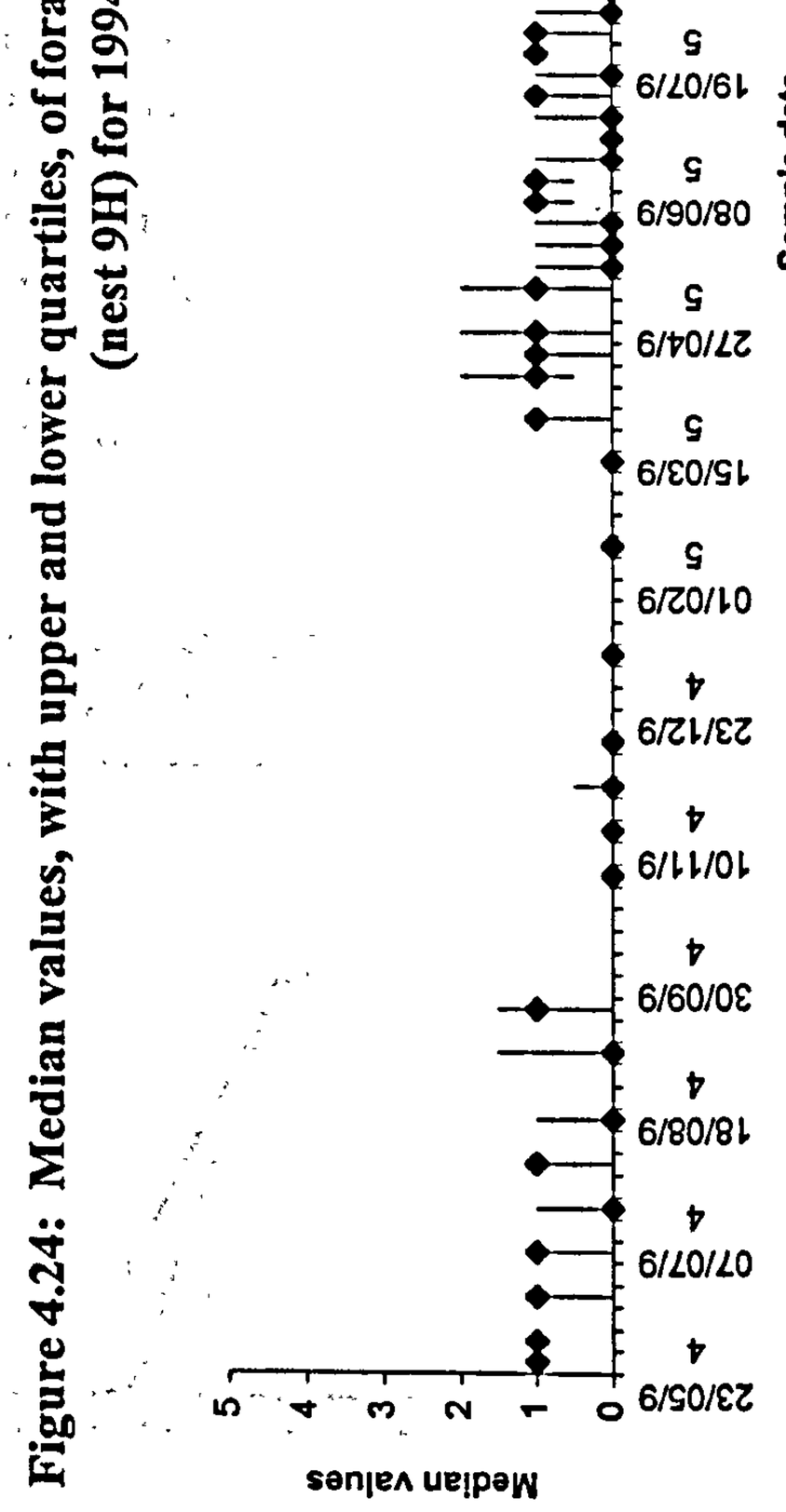


Figure 4.24: Median values, with upper and lower quartiles, of foraging activity on beech for Halse grid 2, grease-banded area (nest 9H) for 1994 to 1996

Figure 4.25: Median values, with upper and lower quartiles, of foraging activity on oak for Halse grid 1, control area (nest 1H) for 1994 to 1996

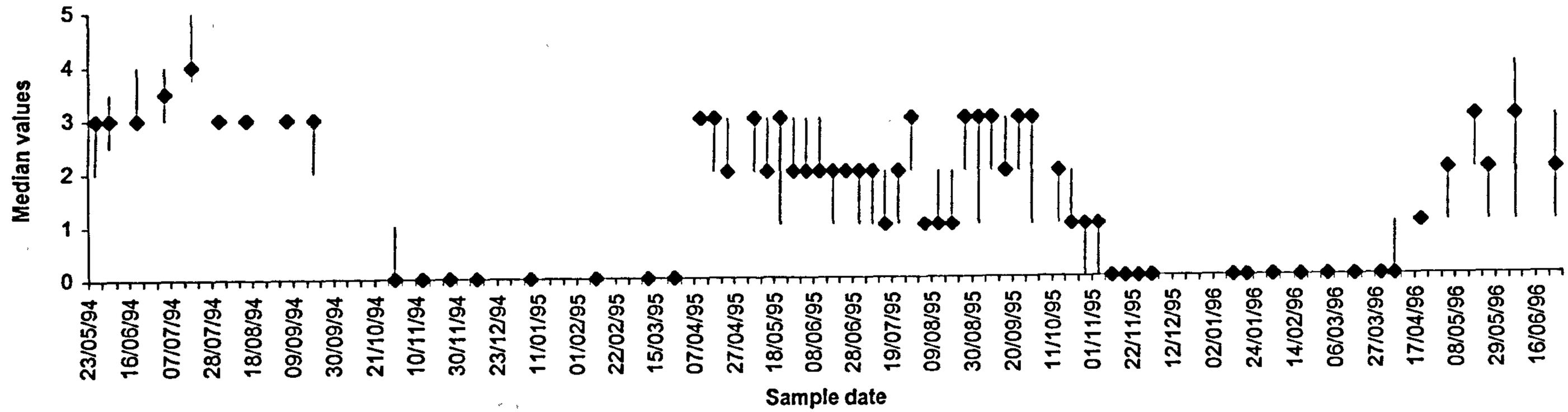
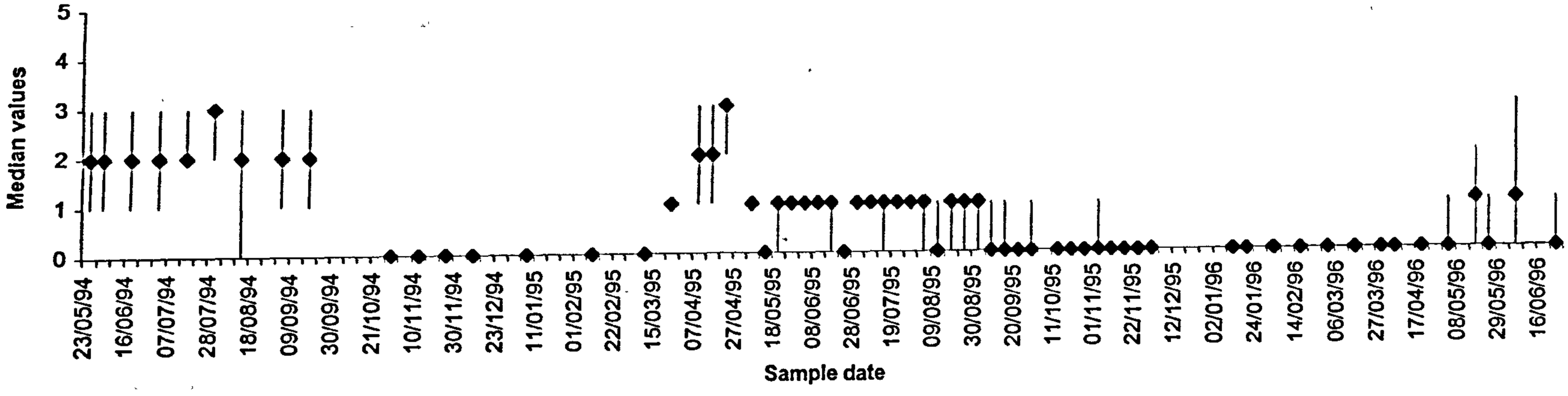


Figure 4.26: Median values, with upper and lower quartiles, of foraging activity on oak for Halse grid 2, greased-banded area (nest 9H) for 1994 to 1996



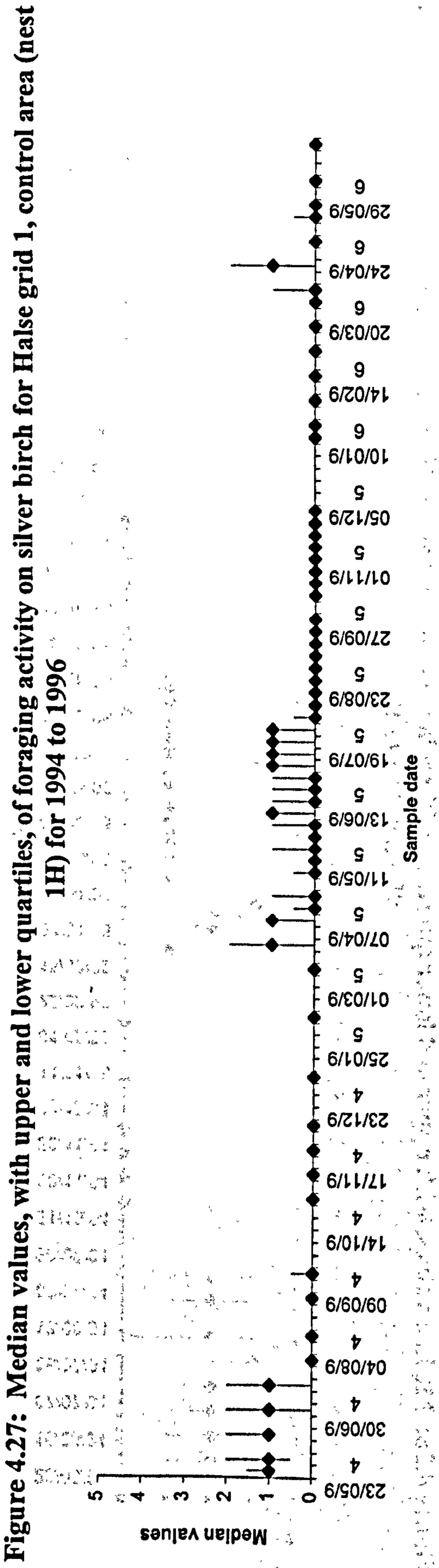


Figure 4.27: Median values, with upper and lower quartiles, of foraging activity on silver birch for Halse grid 1, control area (nest 1H) for 1994 to 1996

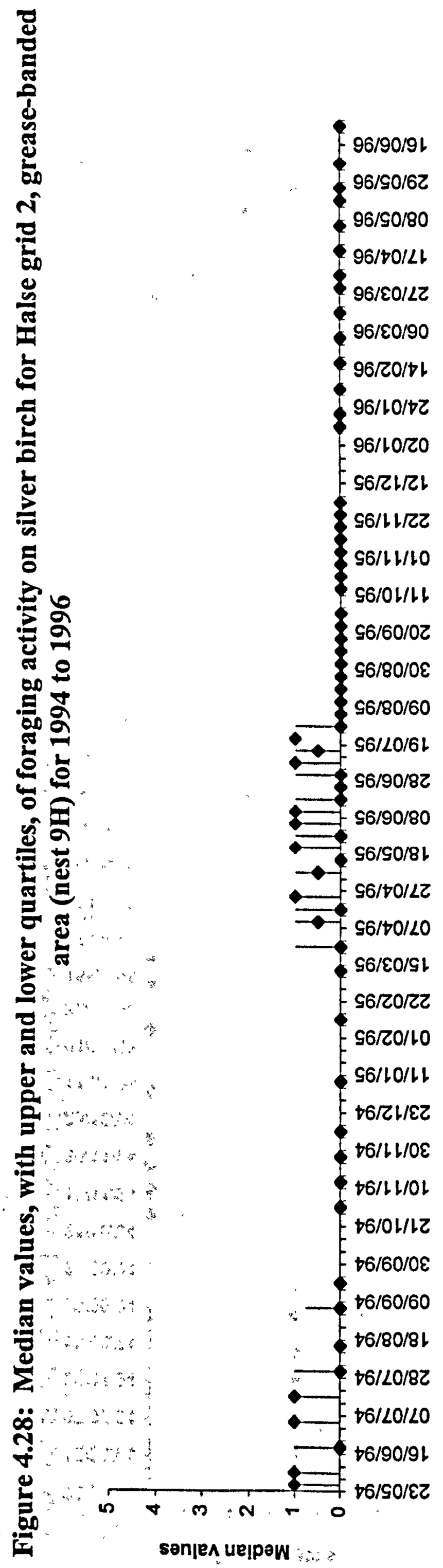


Figure 4.28: Median values, with upper and lower quartiles, of foraging activity on silver birch for Halse grid 2, grease-banded area (nest 9H) for 1994 to 1996

Foraging on different tree species within the grids can be represented as a percentage of available trees since the number of trees available for each species is the same for every sampling occasion. Figure 4.29 for Halse grid 1 and Figure 4.30 for Halse grid 2, show how the percentage of available trees heavily foraged (abundance category 3 and above) changes through the study period. Oak is consistently foraged in preference to beech and silver birch. The grease-banding of trees in Halse grid 2 reduces foraging on oak, beech and silver birch during 1995, as compared to 1994. As with Dimsdale (section 4.3.2.1), a very marked drop in heavy foraging on oak in July 1995 was seen in Halse grid 1. A corresponding rise in heavy foraging on beech was also seen.

From the sampling results, the number of times each tree is recorded as foraged can be presented as a percentage of the total number of possible times it could have been foraged i.e. total number of sampling occasions (April to September). Percentages for just heavily foraged trees (category 3 and above) can be calculated in order to investigate whether such trees were consistently foraged at that rate. Such percentages can also be calculated for trees in different girth categories in order to investigate whether larger trees were foraged more often than smaller trees. Trees were assigned to one of three categories: small (girth <0.7 m), medium (girth 0.7 m to 1.4 m) and large (girth >1.4 m). These size categories gave approximately equal numbers of trees in each category.

As with Dimsdale (section 4.3.2.1), Figure 4.31 to Figure 4.38 show a gradation of foraging effort with large trees consistently foraged more often than smaller trees. There is a wide variation, but oaks are foraged more consistently than beeches. This is particularly noticeable with heavily foraged trees. A higher number of oaks are heavily foraged (abundance category 3 or above) than beeches.

Comparison between the corresponding graphs for Halse grids 1 and 2 shows the effect that the grease-banding had upon the foraging. The grease-banding prevented foraging, and therefore the overall number of foraging occasions was reduced. This causes higher percentages of trees at lower percentages of possible foraging occasions.

Figure 4.29: Graph of percentages of available beech, oak and silver birch trees foraged with abundance category 3 or above in Halse grid 1

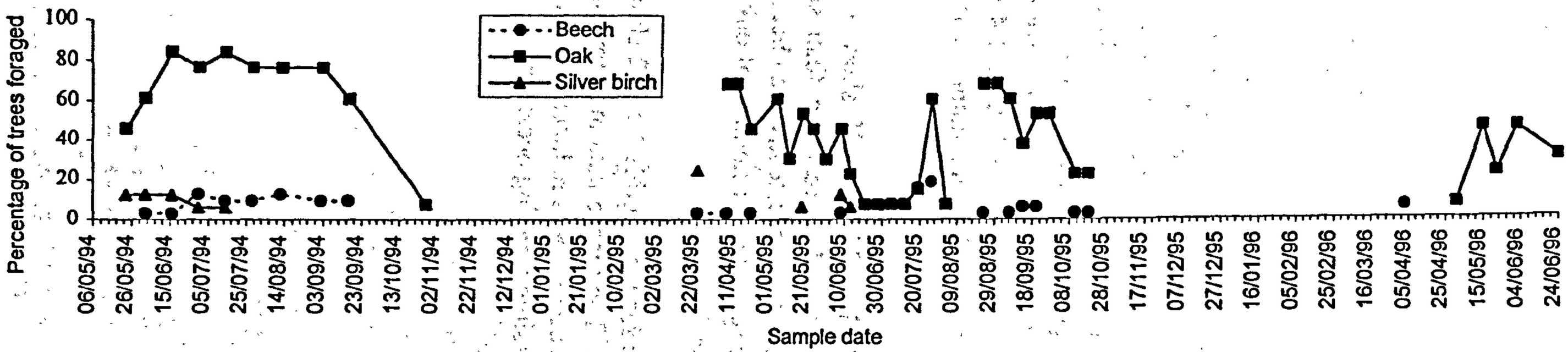


Figure 4.30: Graph of percentages of available beech, oak and silver birch trees foraged with abundance category 3 or above in Halse grid 2

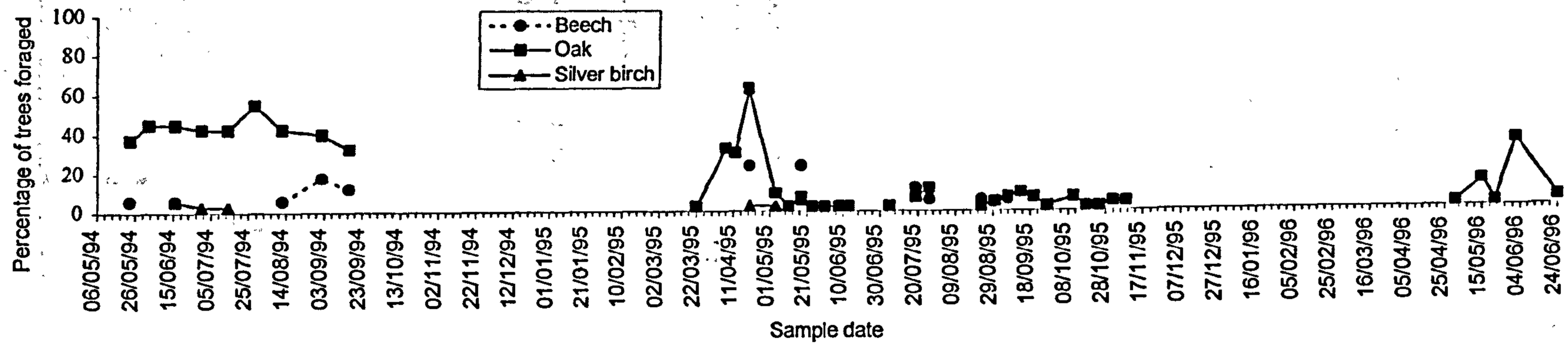


Figure 4.31: Constancy of foraging on different sized beech trees for abundance category 1 or above during the period April to September for 1994 to 1996 for Halse grid 1

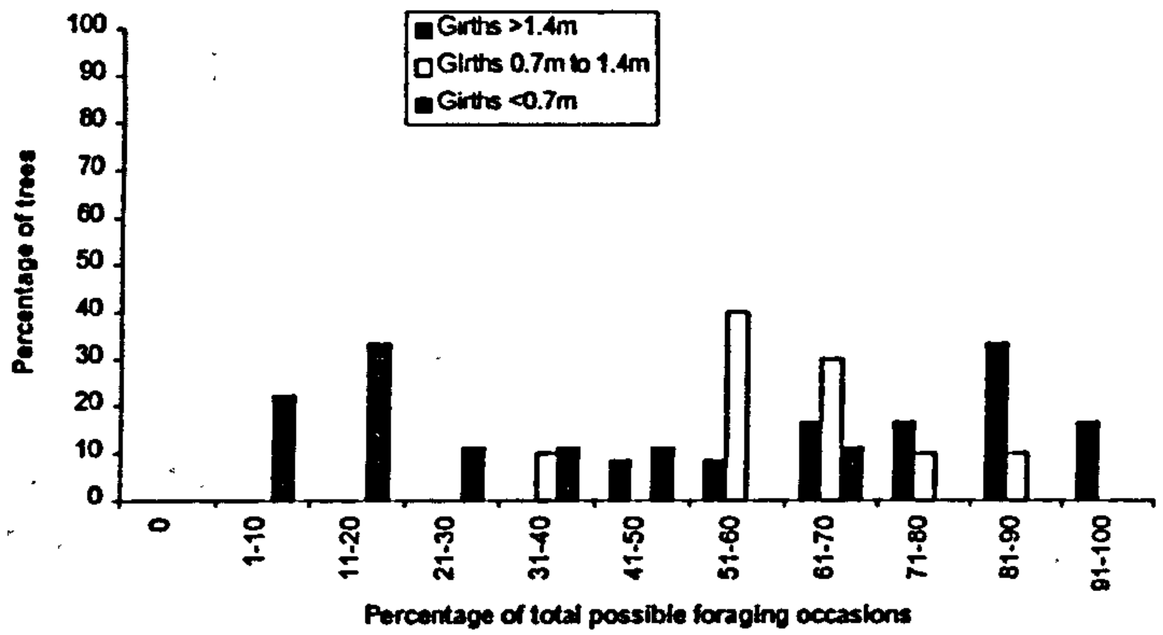


Figure 4.32: Constancy of foraging on different sized beech trees for abundance category 3 or above during the period April to September for 1994 to 1996 for Halse grid 1

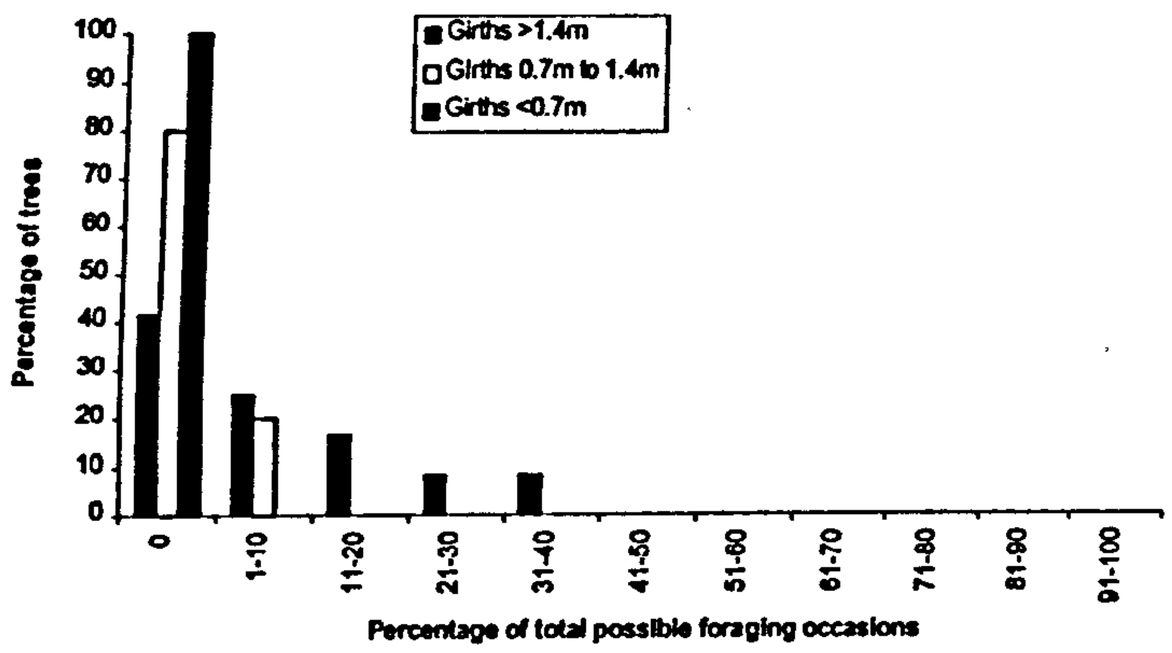


Figure 4.33: Constancy of foraging on different sized beech trees for abundance category 1 or above during the period April to September for 1994 to 1996 for Halse grid 2

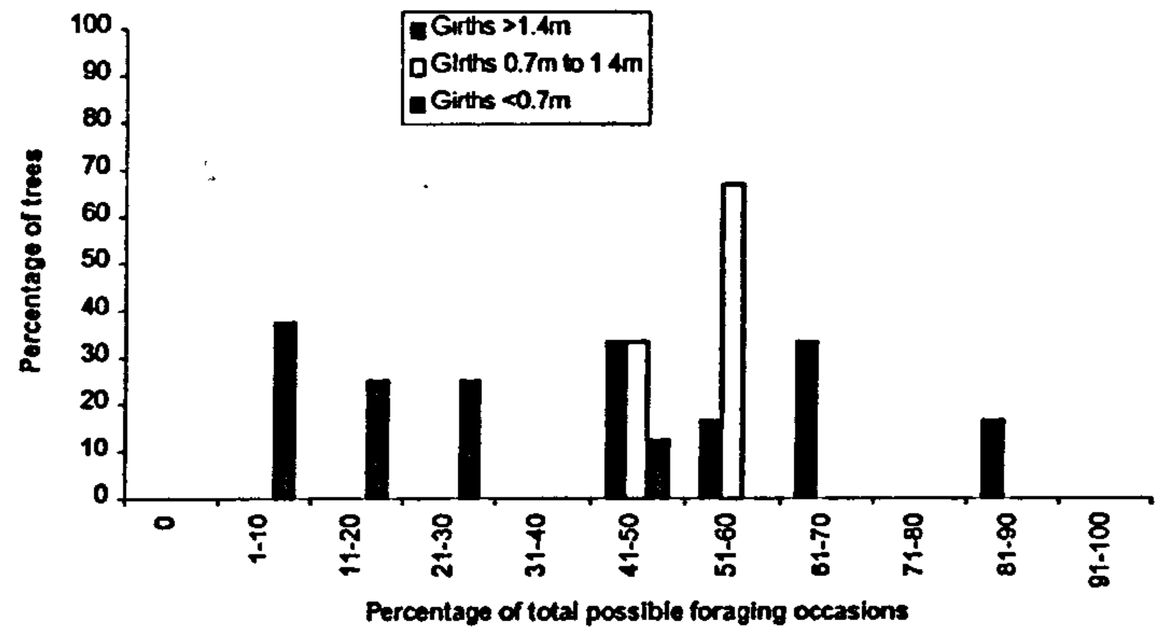


Figure 4.34: Constancy of foraging on different sized beech trees for abundance category 3 or above during the period April to September for 1994 to 1996 for Halse grid 2

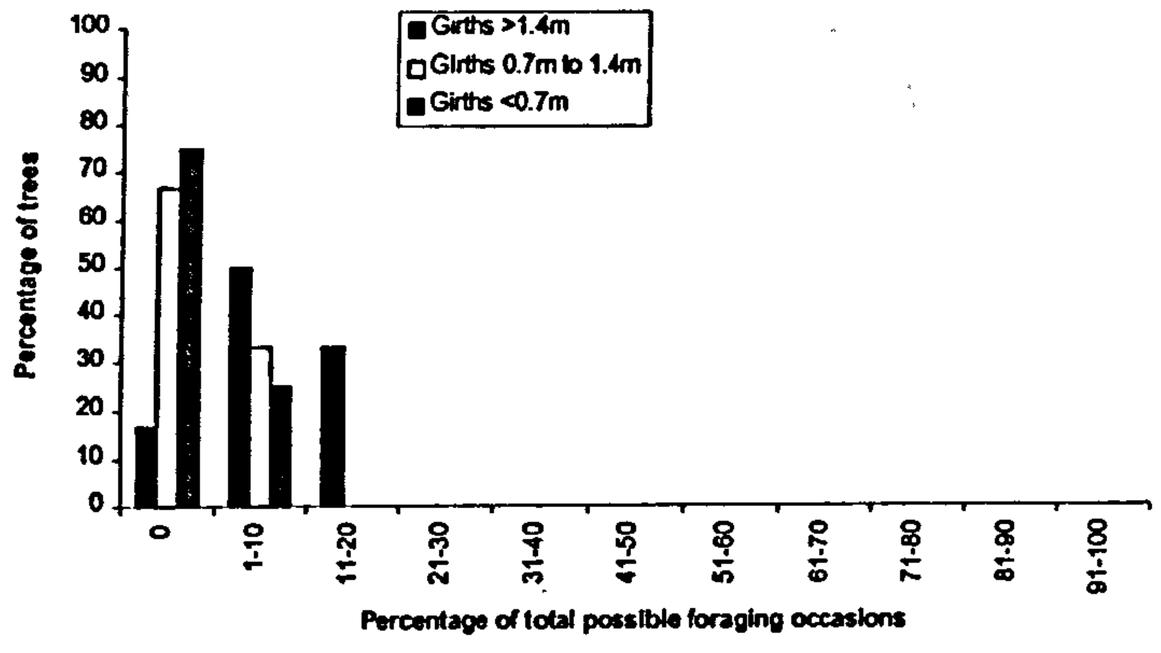


Figure 4.35: Constancy of foraging on different sized oak trees for abundance category 1 or above during the period April to September for 1994 to 1996 for Halse grid 1

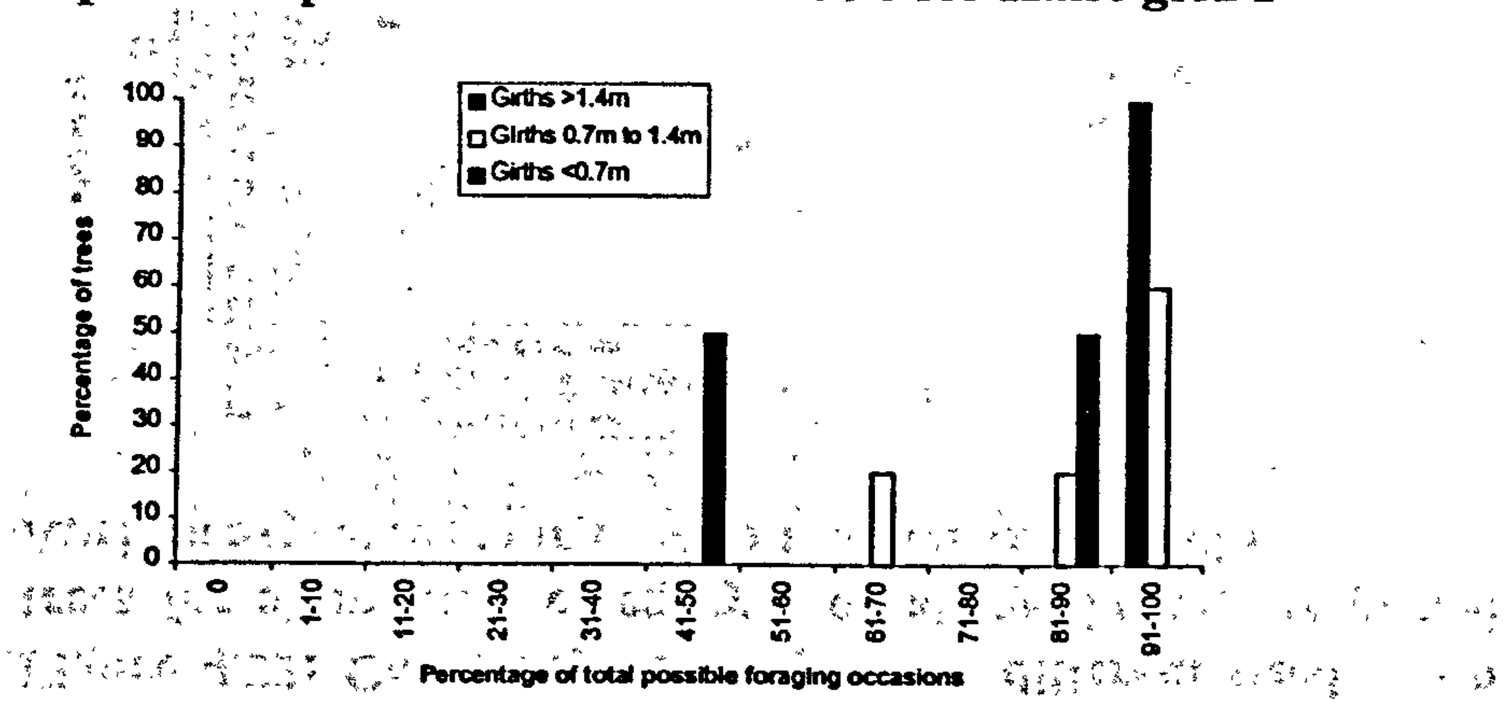


Figure 4.36: Constancy of foraging on different sized oak trees for abundance category 3 or above during the period April to September for 1994 to 1996 for Halse grid 1

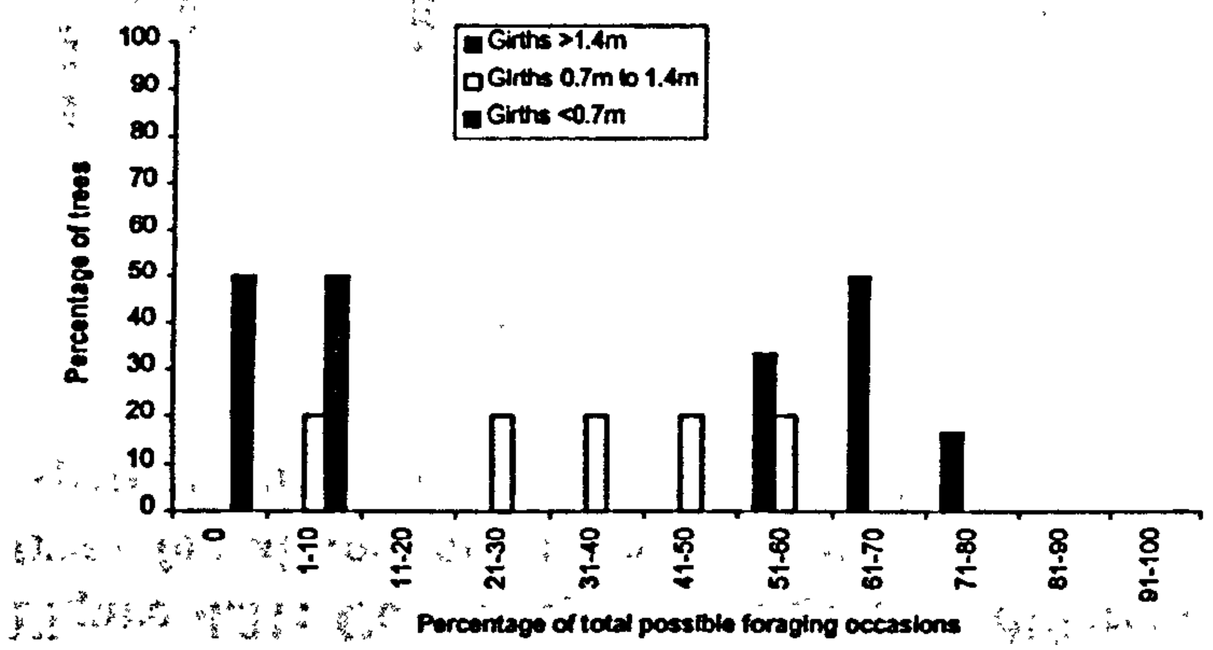


Figure 4.37: Constancy of foraging on different sized oak trees for abundance category 1 or above during the period April to September for 1994 to 1996 for Halse grid 2

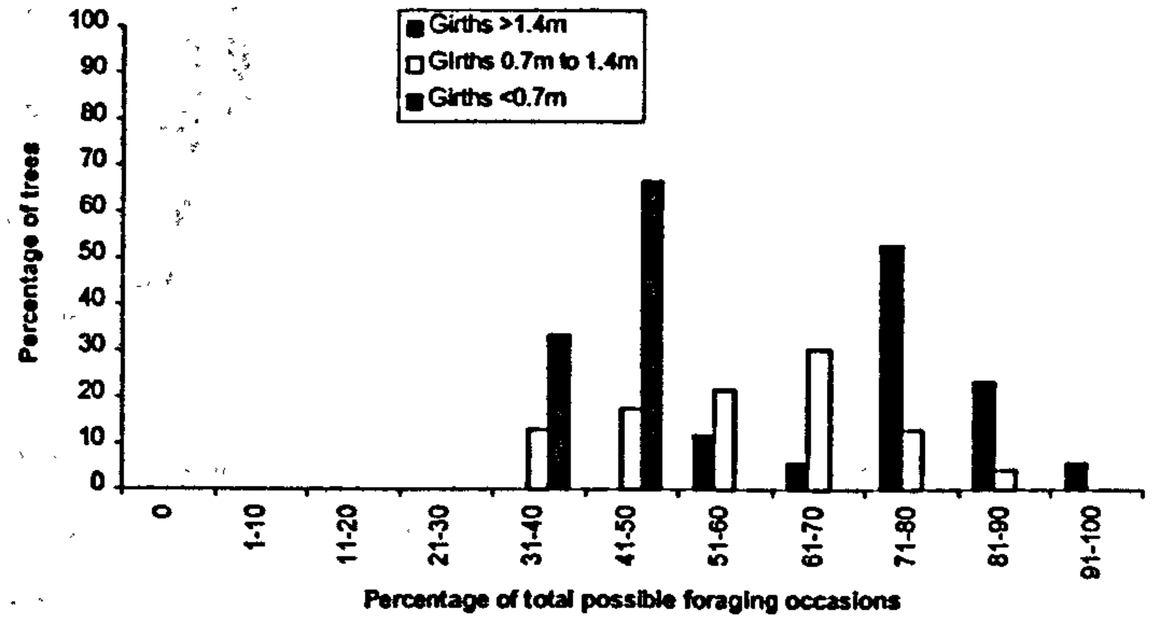
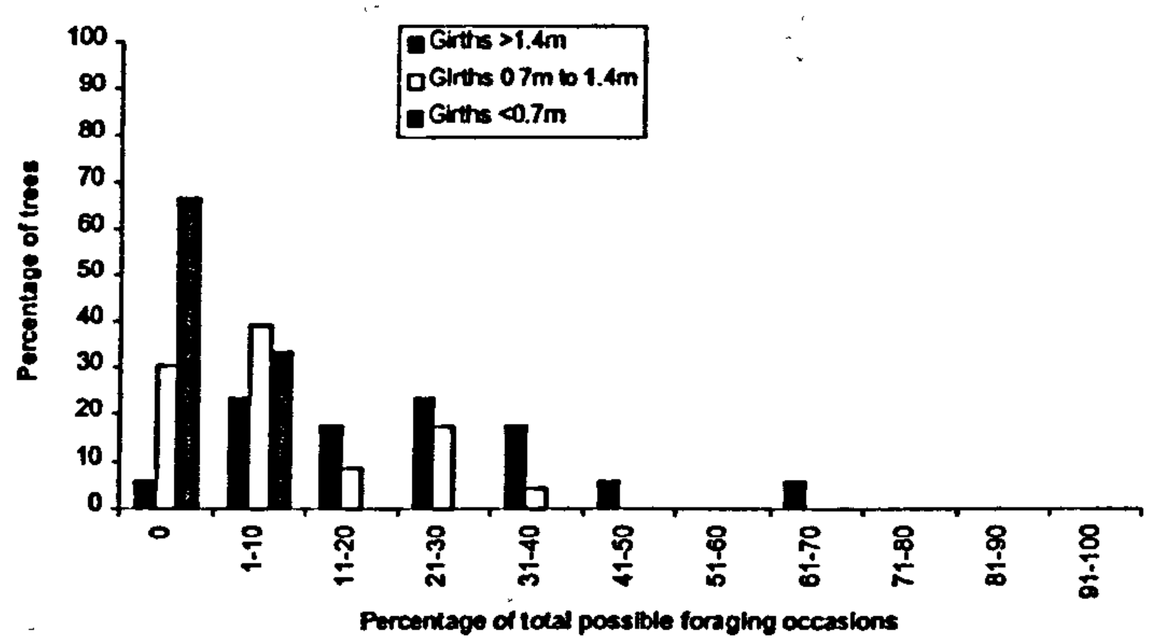


Figure 4.38: Constancy of foraging on different sized oak trees for abundance category 3 or above during the period April to September for 1994 to 1996 for Halse grid 2



For cases in which trees are almost constantly foraged, for example oaks foraged at category 1 or above, then it will always be the same trees foraged in different years. For cases in which the constancy of foraging is less, the constancy of foraging does not show whether there is a tendency for the same trees to be foraged in different years or whether there is variation between years.

The numbers of trees repetitively foraged in the same month (April to September) in different years was calculated. Table 4.12 and Table 4.13 shows how many of the beech trees were foraged in the same month in combinations of years for Halse grids 1 and 2. Table 4.14 and Table 4.15 show how many oaks were foraged repetitively for Halse grids 1 and 2. To determine whether the same trees tended to be foraged, it is necessary to adjust for the variability in foraging effort in the different years. For instance, April 1995 was a lot warmer than April 1996, and therefore there was a lot more foraging in the former year. In order to determine whether the same trees tended to be foraged in the same month in different years, it is therefore necessary to ask whether the foraged trees in the less favourable month were also foraged in the more favourable month. If they were, this would indicate that there was a core of trees that tended to be foraged, with additional trees being foraged in more favourable conditions. In the tables, the number in brackets is the percentage of the lowest number of common trees. For example, in June 1994 39 oaks were foraged with abundance category 1 or above in Halse grid 2 and in June 1996 there were 28. However, only 24 were common to both years, 86 % of the 28 which could have been common to the two years. The results show that fidelity of foraging on oak trees is extremely high, often 100 %, for abundance category 1 or above and 3 or above. Fidelity on beech trees is high for abundance category 1 or above, but lower percentages than for oak trees, but often zero for abundance category 3 or above. The effect of the grease-bands on the foraging in Halse grid 2 can be seen.

Table 4.16 shows the percentage of beech and oak trees continuously foraged during 1994 (June to September), 1995 (April to September) and 1996 (May to September) for Halse grid 1 A similar table was not constructed for Halse grid 2 due to the disruption caused by the grease-banding. Continuous foraging on beech is very low (a maximum of 7 %) for abundance category 1 or above and zero for heavy foraging (abundance category 3 or above). Up to 9 % of oak trees were continuously foraged for abundance category 1 or above and for heavy foraging (abundance category 3 or above) a maximum for 5 % was recorded.

Table 4.12: Number of beech trees foraged repetitively in a month (percentage of common trees), April to September in 1994, 1995 and 1996 for Halse grid 1

Number of available trees = 31

	Abundance category 1 or above						Abundance category 3 or above					
	April	May	June	July	August	September	April	May	June	July	August	September
94	-	16	29	25	15	21	-	0	5	4	4	3
95	27	28	27	30	23	25	2	0	1	8	1	3
96	20	18	18	-	-	-	2	0	0	-	-	-
94-95-96	-	12 (75)	18 (100)	-	-	-	-	0	0	-	-	-
94-95	-	15 (94)	27 (100)	25 (100)	14 (93)	19 (90)	-	0	1 (100)	4 (100)	1 (100)	2 (67)
94-96	-	13 (81)	18 (100)	-	-	-	-	0	0	-	-	-
95-96	19	17 (94)	18 (100)	-	-	-	0	0	0	-	-	-

Table 4.13: Number of beech trees foraged repetitively in a month (percentage of common trees), April to September in 1994, 1995 and 1996 for Halse grid 2

Number of available trees = 17

	Abundance category 1 or above						Abundance category 3 or above					
	April	May	June	July	August	September	April	May	June	July	August	September
94	-	10	12	11	8	11	-	1	1	0	1	3
95	14	15	15	15	10	4	4	4	0	2	1	1
96	0	6	4	-	-	-	0	0	0	-	-	-
94-95-96	-	5 (83)	4 (100)	-	-	-	-	0	0	-	-	-
94-95	-	10 (100)	12 (100)	11 (100)	7 (88)	4 (100)	-	0	0	0	0	0
94-96	-	5 (83)	4 (100)	-	-	-	-	0	0	-	-	-
95-96	0	6 (100)	4 (100)	-	-	-	0	0	0	-	-	-

Table 4.14: Number of oak trees foraged repetitively in a month (percentage of common trees), April to September in 1994, 1995 and 1996 for Halse grid 1

Number of available trees = 14

	Abundance category 1 or above						Abundance category 3 or above					
	April	May	June	July	August	September	April	May	June	July	August	September
94	-	10	13	13	13	14	-	6	11	11	10	10
95	14	14	14	14	13	13	11	9	6	8	9	9
96	10	13	14	-	-	-	0	7	9	-	-	-
94-95-96	-	10 (100)	13 (100)	-	-	-	-	4 (67)	6 (100)	-	-	-
94-95	-	10 (100)	13 (100)	13 (100)	12 (92)	13 (100)	-	5 (83)	6 (100)	8 (100)	9 (100)	9 (100)
94-96	-	10 (100)	13 (100)	-	-	-	-	4 (67)	8 (89)	-	-	-
95-96	10 (100)	13 (100)	14 (100)	-	-	-	0	7 (100)	6 (100)	-	-	-

Table 4.15: Number of oak trees foraged repetitively in a month (percentage of common trees), April to September in 1994, 1995 and 1996 for Halse grid 2

Number of available trees = 44

	Abundance category 1 or above						Abundance category 3 or above					
	April	May	June	July	August	September	April	May	June	July	August	September
94	-	33	39	40	29	38	-	15	22	25	17	17
95	44	44	44	44	40	22	30	5	1	7	2	
96	0	33	28	-	-	-	0	7	17	-	-	-
94-95-96	-	25 (76)	24 (86)	-	-	-	-	1 (20)	1 (100)	-	-	-
94-95	-	33 (100)	39 (100)	40 (100)	26 (90)	21 (95)	-	3 (60)	1 (100)	6 (86)	2 (100)	3 (60)
94-96	-	25 (76)	24 (86)	-	-	-	-	5 (71)	14 (82)	-	-	-
95-96	0	33 (100)	28 (100)	-	-	-	0	1 (20)	1 (100)	-	-	-

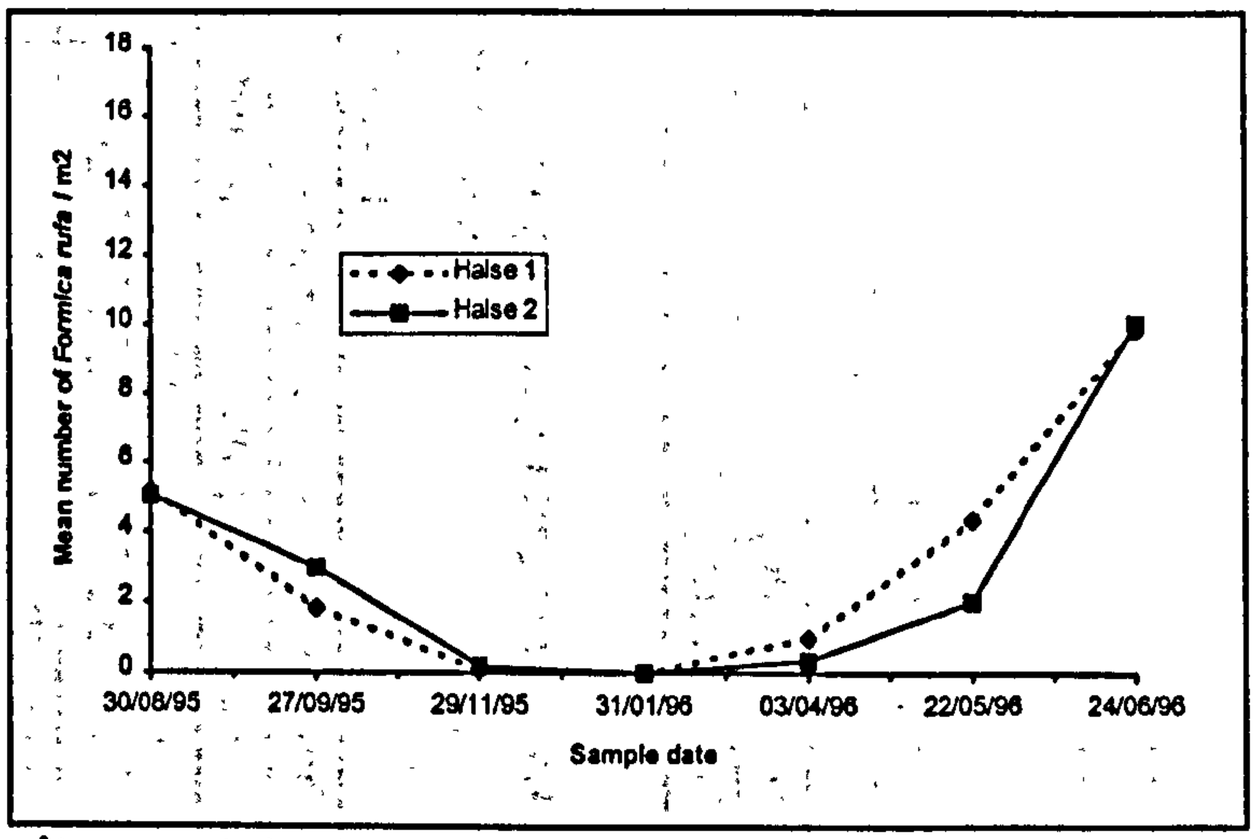
Table 4.16: Percentage of beech and oak trees continuously foraged in 1994, 1995 and 1996 for Halse grid 1

% of trees continuously foraged	Abundance category 1 or above			Abundance category 3 or above		
	1994	1995	1996	1994	1995	1996
Beech	7	0	1	0	0	0
Oak	9	8	9	5	0	1

4.3.3.2 Quadrats

The mean number of *F. rufa* per m^2 for each sample date is shown in Figure 4.39. The data is shown in Appendix E. The overall pattern is similar to Dimsdale 1 and 2. The mean numbers between the 2 sites are not comparable since each site was sampled on a separate day. The pattern of activity and the numbers of *F. rufa* workers for grids 1 and 2 are highly correlated (Pearson product-moment correlation coefficient) (r=0.96, $p<0.001$). This indicates that numbers of foragers did not change even though the foraging activity in the tree canopy was greatly reduced by grease-banding.

Figure 4.39: Mean quadrat values for Halse grids 1 (nest 1H) and 2 (nest 9H) for 1995 to 1996



4.3.4 Whole site counts

4.3.4.1 Dimsdale

4.3.4.1.1 Patterns in foraging activity on trees

The biggest changes occur seasonally within each year. These changes can more easily be seen by charting the increases and decreases in the median values for whole site foraging activity throughout the year for different tree species (Figure 4.40 to Figure 4.43).

Figure 4.40: Median values, with upper and lower quartiles, of foraging activity on beech for Dimsdale whole site counts for 1994 to 1996

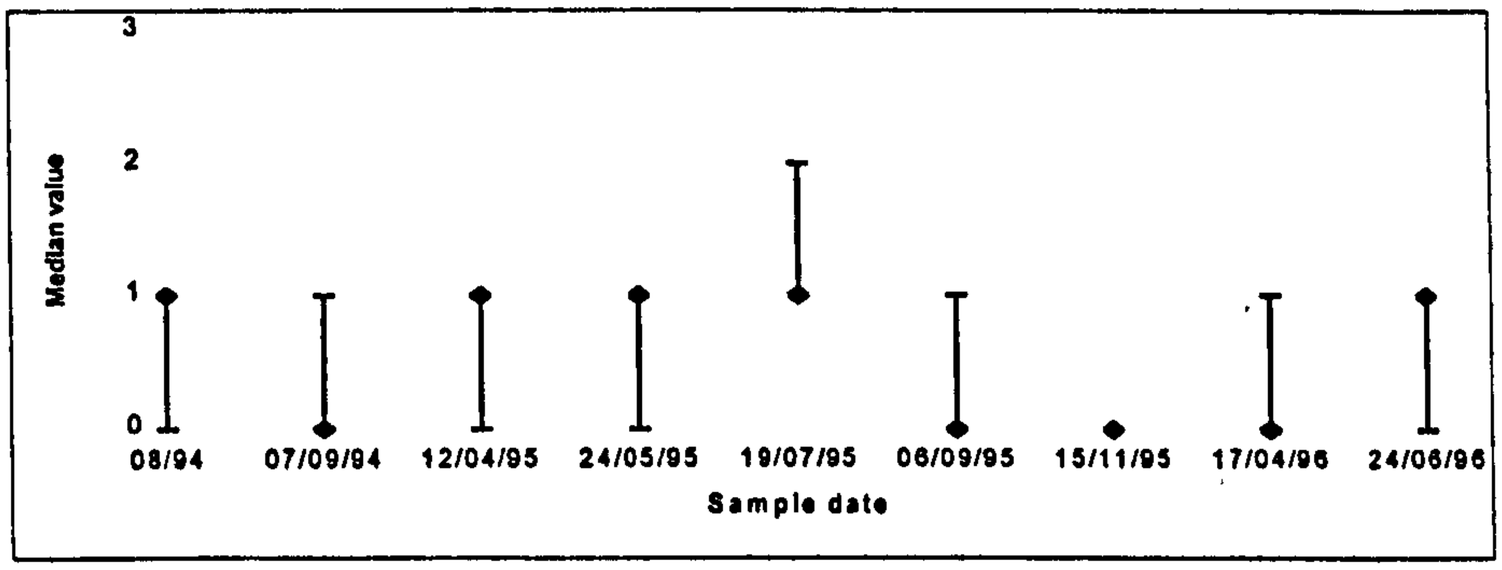


Figure 4.41: Median values with upper and lower quartiles, of foraging activity on oak for Dimsdale whole site counts for 1994 to 1996

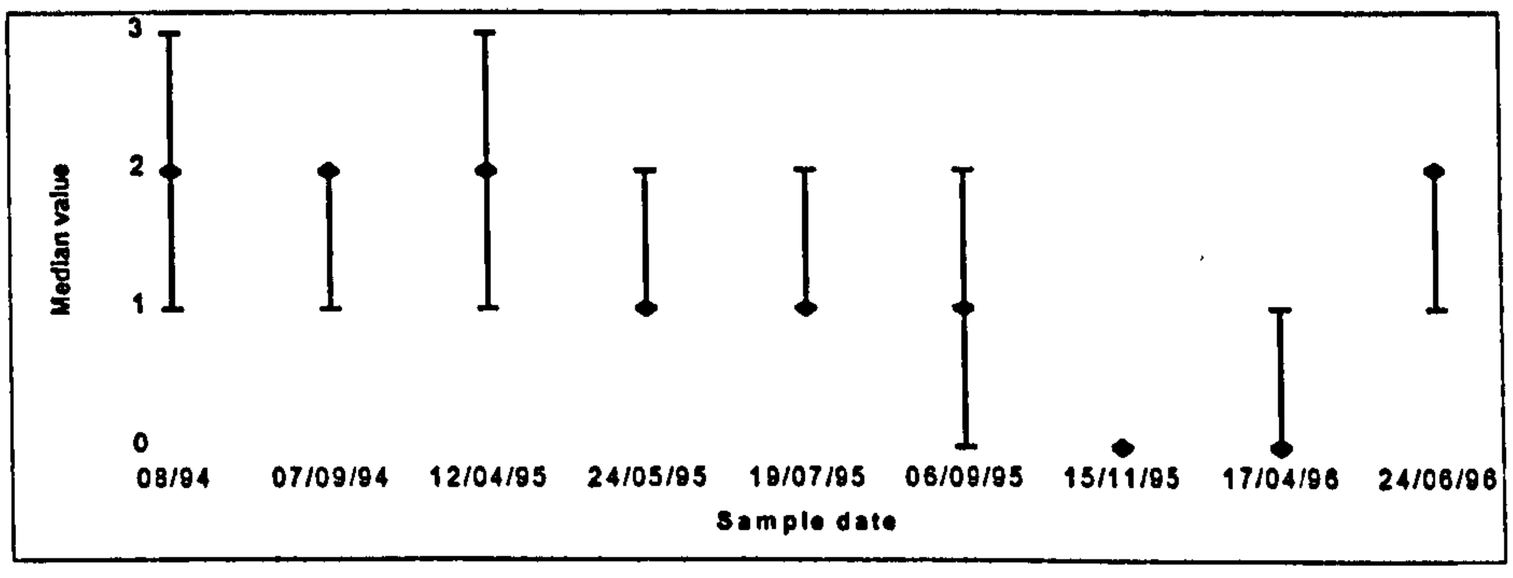


Figure 4.42: Median values, with upper and lower quartiles, of foraging activity on silver birch for Dimsdale whole site counts for 1994 to 1996

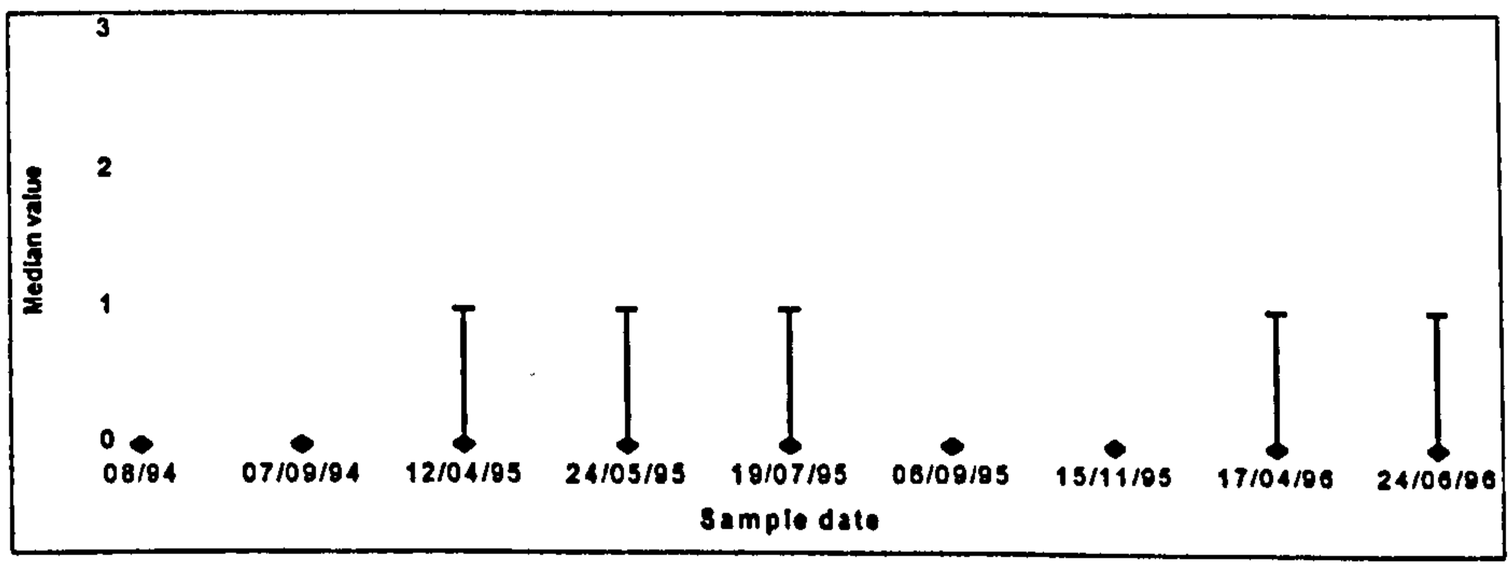
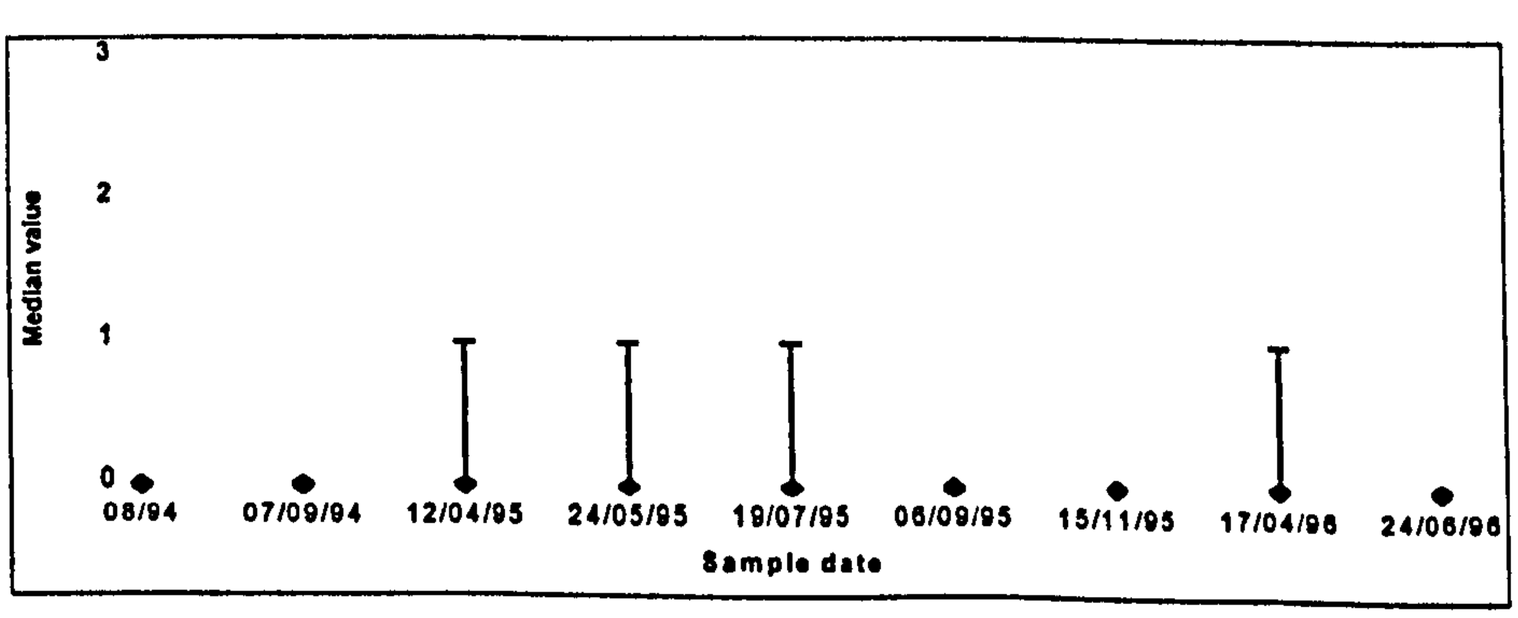


Figure 4.43: Median values, with upper and lower quartiles, of foraging activity on miscellaneous trees for Dimsdale whole site counts for 1994 to 1996



During the winter months (December to March), the grid counts show that little or no foraging occurs near the nest, thus whole sites counts were unnecessary. April (1995 and 1996) represents the spring count which took place soon after the grid counts indicated *F. rufa* had become active. The early summer count in May (1995) shows a build up in activity. The midsummer count (July in 1995, June in 1996) showed a foraging maximum. September (1995) showed the beginning of the decline in activity towards winter with little activity in November (1995). The changes through time are summarised in Table 4.17.

Table 4.17: Summary of the changes in median values of whole site foraging activity counts for Dimsdale 1994 to 1996

Sample Date	Average temperature during the foraging count / °C	Comparison of median values, upper and lower quartiles of whole site foraging activity counts for Dimsdale 1994 to 1996
08/94	22	Median value of 2 for oaks, foraging on beech is lower with a median value of 1.
07/09/94	16	Medians unchanged for oak, but the upper quartile drops from 3 to 2 indicating a decrease foraging intensity. The median value for beech drops from 1 to 0.
12/04/95	14	Beech and oak median values and quartiles are the same as for August 1994. Foraging intensity on oak is at its peak for 1995. There is activity on silver birch and miscellaneous trees with the upper quartile of 1.
24/05/95	19	The median value on oak decreases from 2 to 1. The rest of the trees are unchanged.
19/07/95	23	Foraging intensity on beech reaches its peak for 1995 with an upper quartile of 2. The rest of the trees are unchanged.
06/09/95	15	Foraging intensity across all trees begins to decrease with beech and oak with the median value of both dropping one category. Activity on silver birch and miscellaneous trees decreases with an upper quartile of 0.
15/11/95	11	Activity across the whole site is 0.
17/04/96	11	Activity in 1996 is much lower than the same time in 1995 with median values of 0 and upper quartiles of 1 across all trees.
24/06/96	16	The median value for beech rises from 0 to 1 and for oak from 0 to 2. Silver birch is unchanged but the upper quartile for miscellaneous trees drops from 1 to 0.

In order to investigate whether the intensity of foraging was related to the size of the tree, the abundance category for each tree was correlated with the tree's girth. Spearmans Rank Correlation was used. A nonparametric measure was used as no assumption about the shape of the distribution had to be made and the abundance data was categorical (Siegel 1956). The results are presented in Table 4.18 for beech, oak and silver birch for each whole site sampling date. A large number of correlations were positive and highly significant, indicating that larger trees are more heavily foraged than smaller trees.

Table 4.18: Correlation of abundance of *Formica rufa* against tree girth for oak, beech and silver birch for Dimsdale whole site counts

* = significant at 0.05, ** = significant at 0.01, *** = significant at 0.001, ns = not significant

	Beech			Oak			Silver birch		
Sample date	n	*r*	Sig.	n	*r*	Sig.	n	*r*	Sig.
07/09/94	306	0.22	***	351	0.62	***	82	0.20	ns
12/04/95	311	0.40	***	352	0.46	***	83	0.41	***
24/05/95	309	0.23	***	353	0.39	***	82	0.28	*
19/07/95	309	0.57	***	353	0.40	***	83	0.45	*
06/09/95	311	0.31	***	353	0.53	***	83	0.21	ns
15/11/95	311	0.08	ns	354	0.14	**	83	0.21	ns
17/04/96	311	0.30	***	349	0.21	***	83	0.50	***
24/06/96	311	0.45	***	353	0.47	***	83	0.28	*

For every sample, oak has the highest percentage of available trees foraged, which indicates its importance as a source of food. Beech and silver birch are the second and third most popular choices. The values for July 1995 represent the maximum foraging effort with the percentage of available trees left unforaged at its lowest point for all tree species (Table 4.19).

4.3.4.1.2 Changes in foraging areas

The first map of nest foraging areas for Dimsdale uses values collected as each tree was labelled which took place over several days (1st, 4th, 9th, 10th, and 18th August 1994). All other maps are produced from values collected in a single sample day (Figure 4.44 to Figure 4.52).

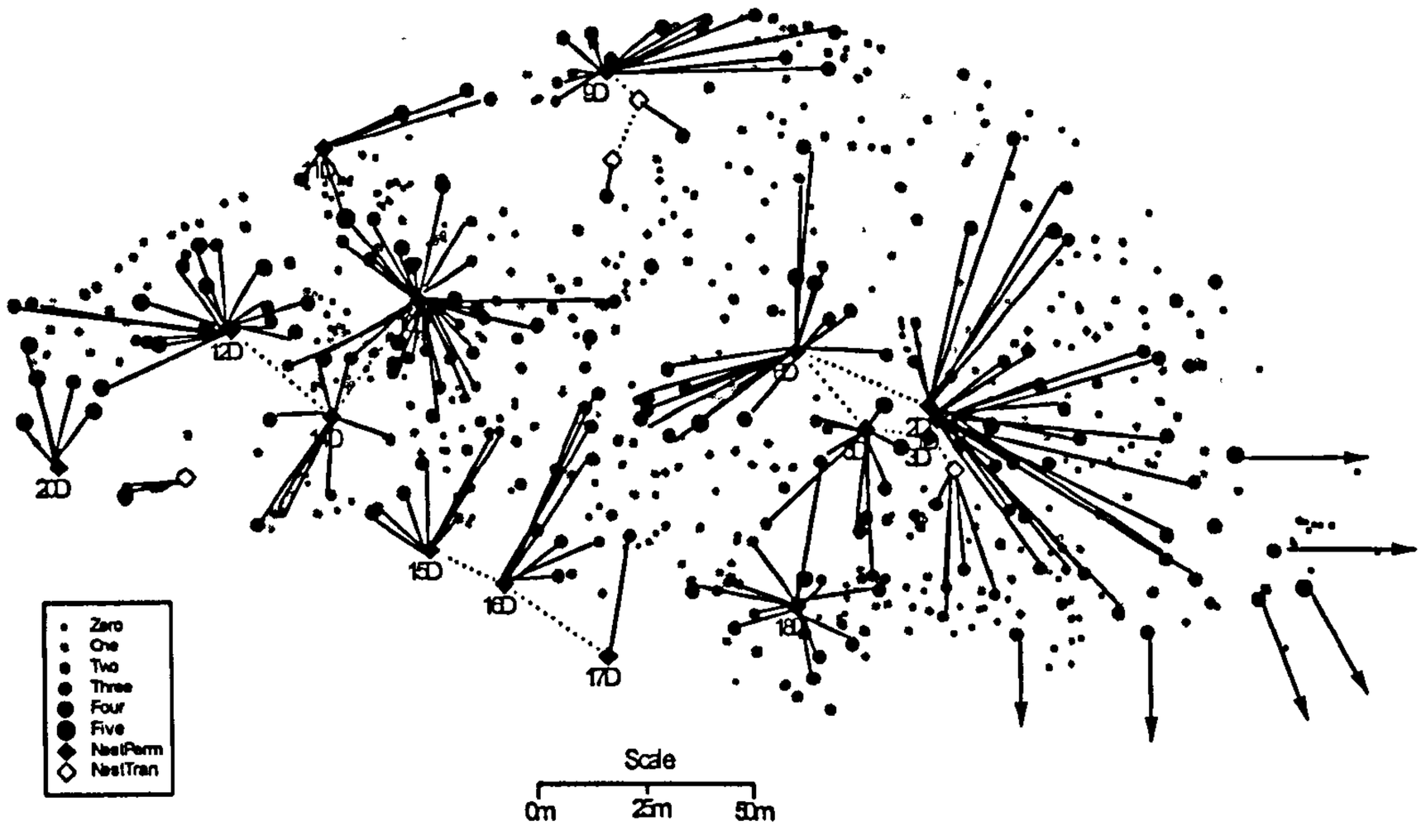
Maps showing abundance scores for individual trees on each sampling date were plotted. The data on abundance scores is in Appendix F. Each dot represents the location of a tree. The larger and darker the dot, the higher up the abundance scale (0 to 5) the count was.

Table 4.19: Percentage of available trees foraged for each scale of abundance value for each sampling date in Dimsdale

	Scale of abundance	08/94	07/09/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
Beech	0	49.7	64.5	42.3	43.9	11.9	67.3	93.6	59.9	40.1
	1	40.3	30.6	52.2	51.0	51.6	24.4	5.8	36.5	52.2
	2	7.5	4.2	3.8	4.5	20.0	6.7	0.6	2.6	6.1
	3	1.6	0.7	1.0	0.6	15.2	1.6	0.0	1.0	1.3
	4	1.0	0.0	0.6	0.0	1.3	0.0	0.0	0.0	0.3
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oak	0	16.6	14.5	8.2	9.0	5.6	26.0	89.9	53.4	6.2
	1	17.7	31.3	40.8	44.9	64.1	31.1	8.5	40.9	40.4
	2	23.3	30.1	23.5	25.1	20.1	22.3	1.4	5.1	27.4
	3	33.4	21.3	21.2	20.3	8.8	18.1	0.3	0.6	20.9
	4	8.7	2.8	5.4	0.3	1.4	2.5	0.0	0.0	4.8
	5	0.3	0.0	0.8	0.3	0.0	0.0	0.0	0.0	0.3
Silver birch	0	82.1	79.5	58.3	56.6	40.5	77.4	97.6	56.0	52.4
	1	14.3	20.5	35.7	34.9	52.4	22.6	2.4	26.2	35.7
	2	3.6	0.0	6.0	7.2	7.1	0.0	0.0	13.1	8.3
	3	0.0	0.0	0.0	1.2	0.0	0.0	0.0	4.8	3.6
	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miscellaneous	0	86.4	100.0	67.4	71.7	39.1	84.8	100.0	71.7	84.8
	1	13.6	0.0	30.4	23.9	58.7	15.2	0.0	23.9	13.0
	2	0.0	0.0	0.0	4.3	2.2	0.0	0.0	4.3	2.2
	3	0.0	0.0	2.2	0.0	0.0	0.0	0.0	0.0	0.0
	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Figure 4.44: Map of foraging activity for Dimsdale whole site count for 08/94 a) trails to nest b) approximate boundaries

a)



b)

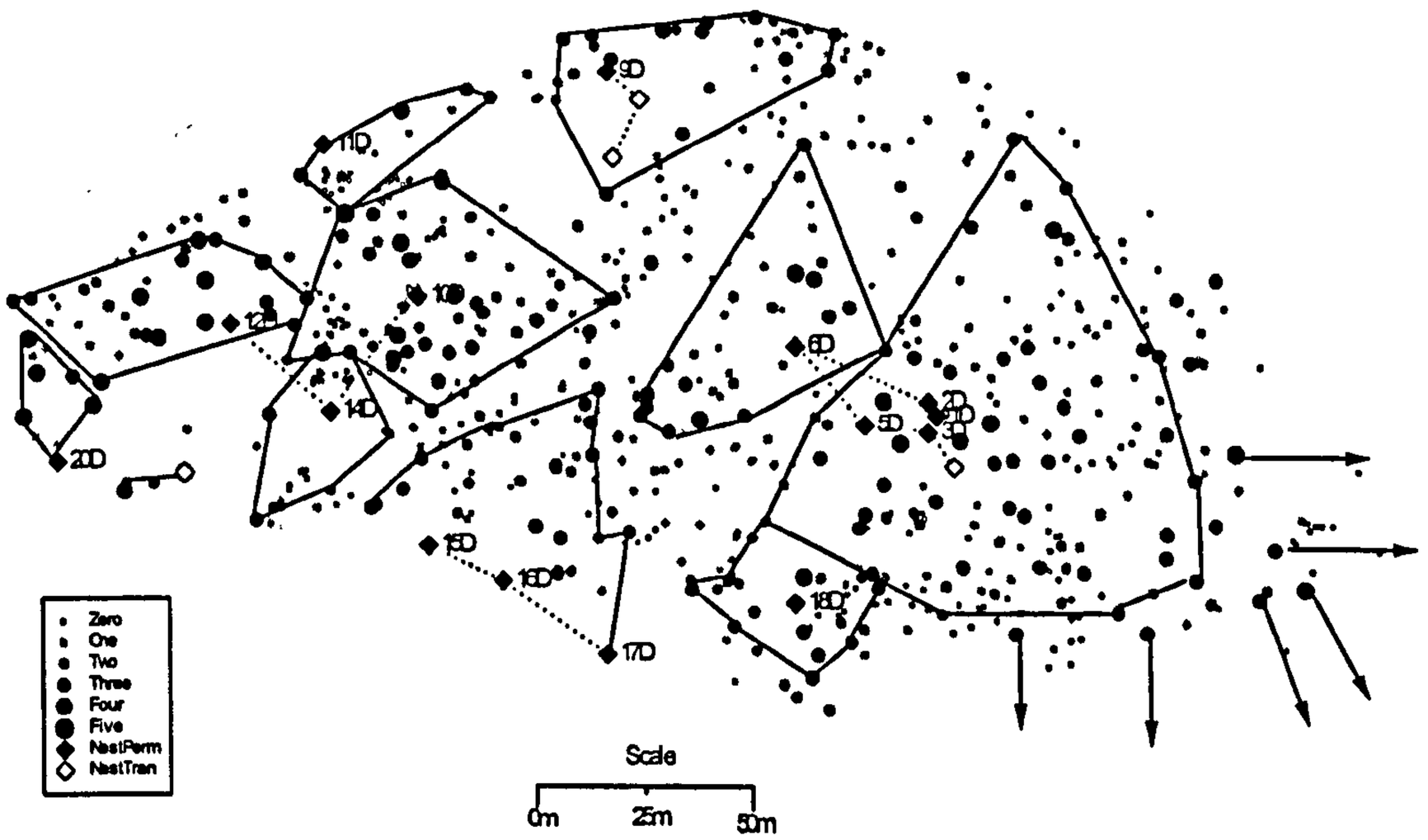
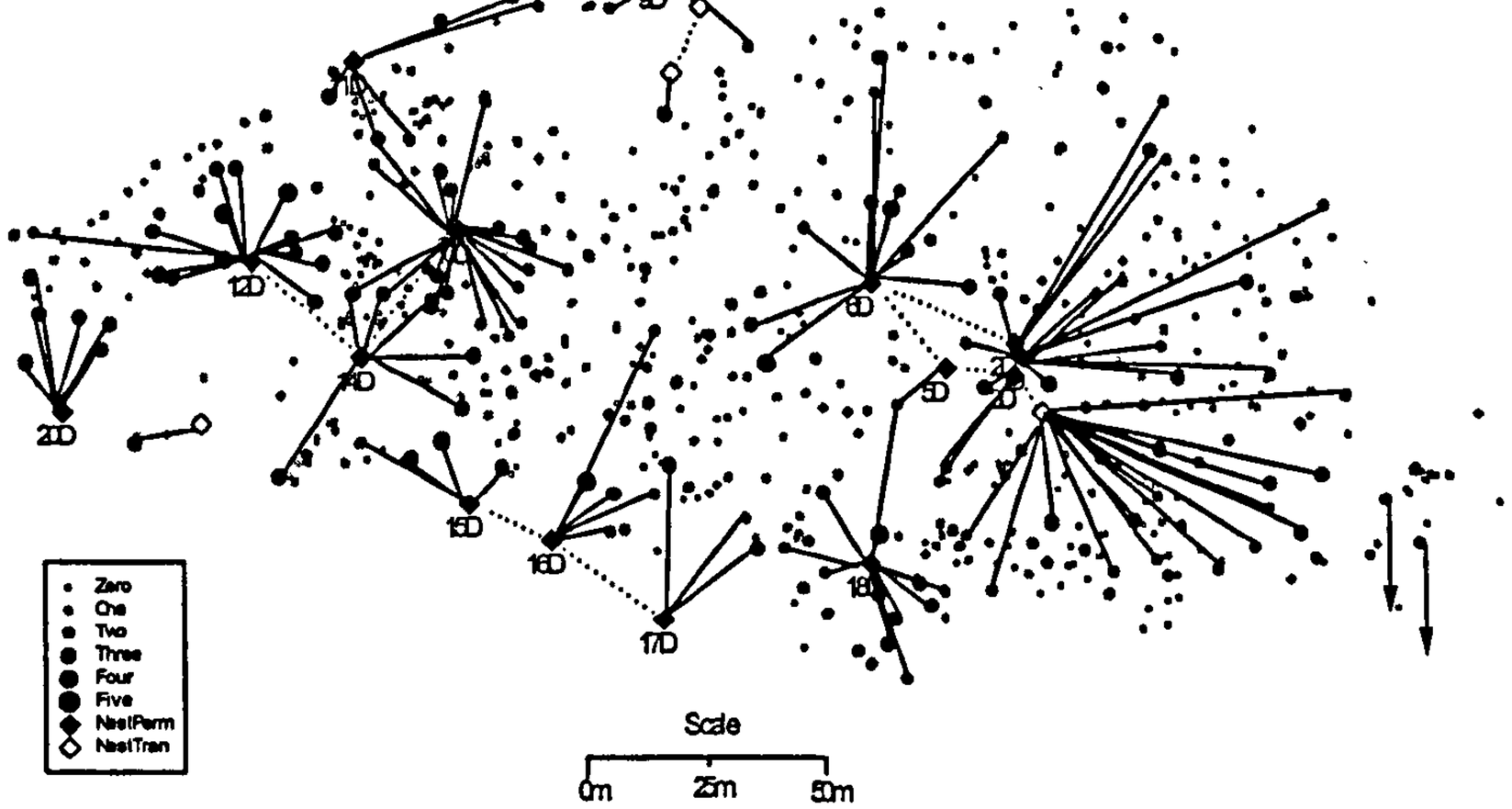


Figure 4.45: Map of foraging activity for Dimsdale whole site count for 07/09/94 a) trails to nest b) approximate boundaries

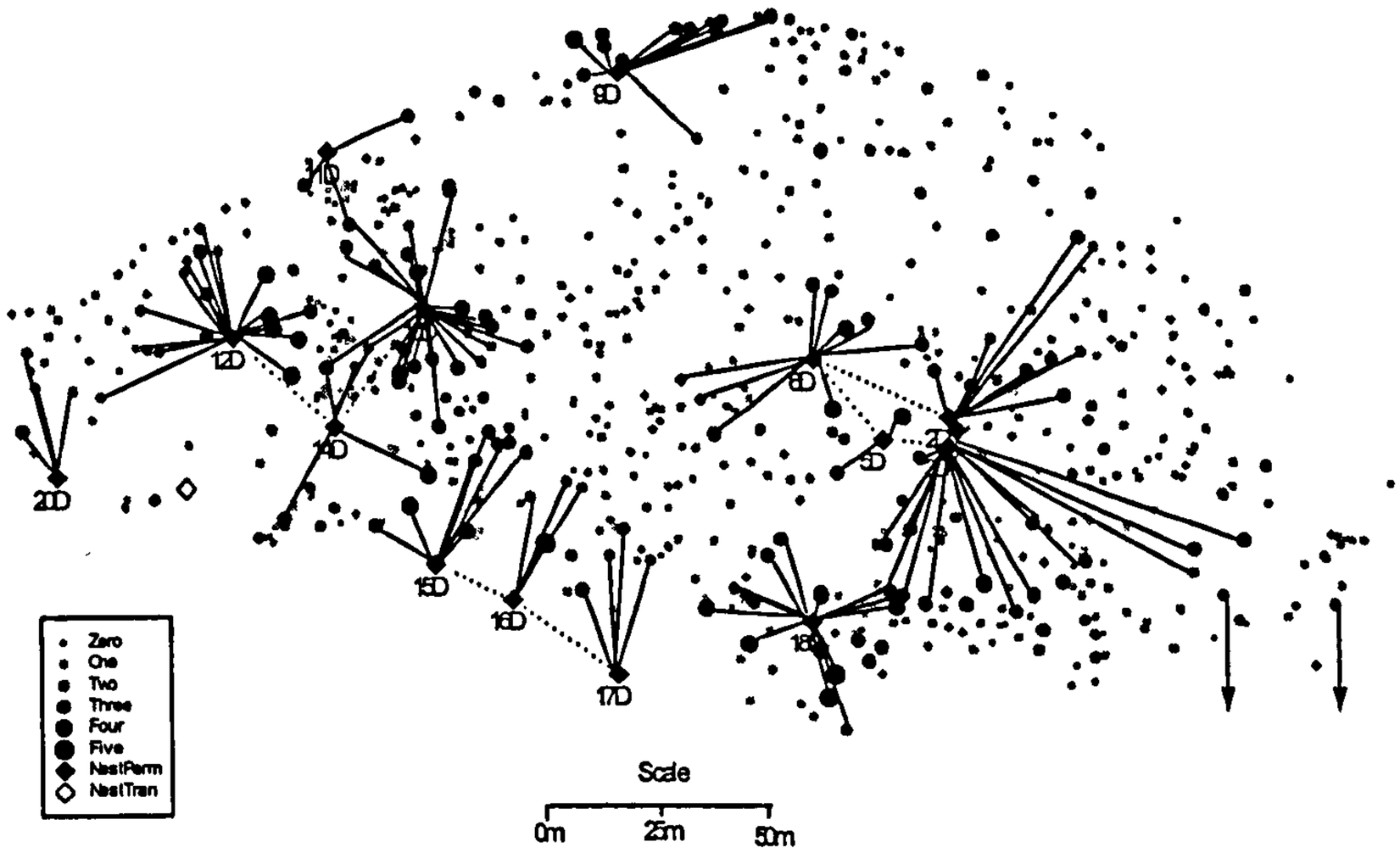
a)



b)

Figure 4.46: Map of foraging activity for Dimsdale whole site count for 12/04/95 a) trails to nest b) approximate boundaries

a)



b)

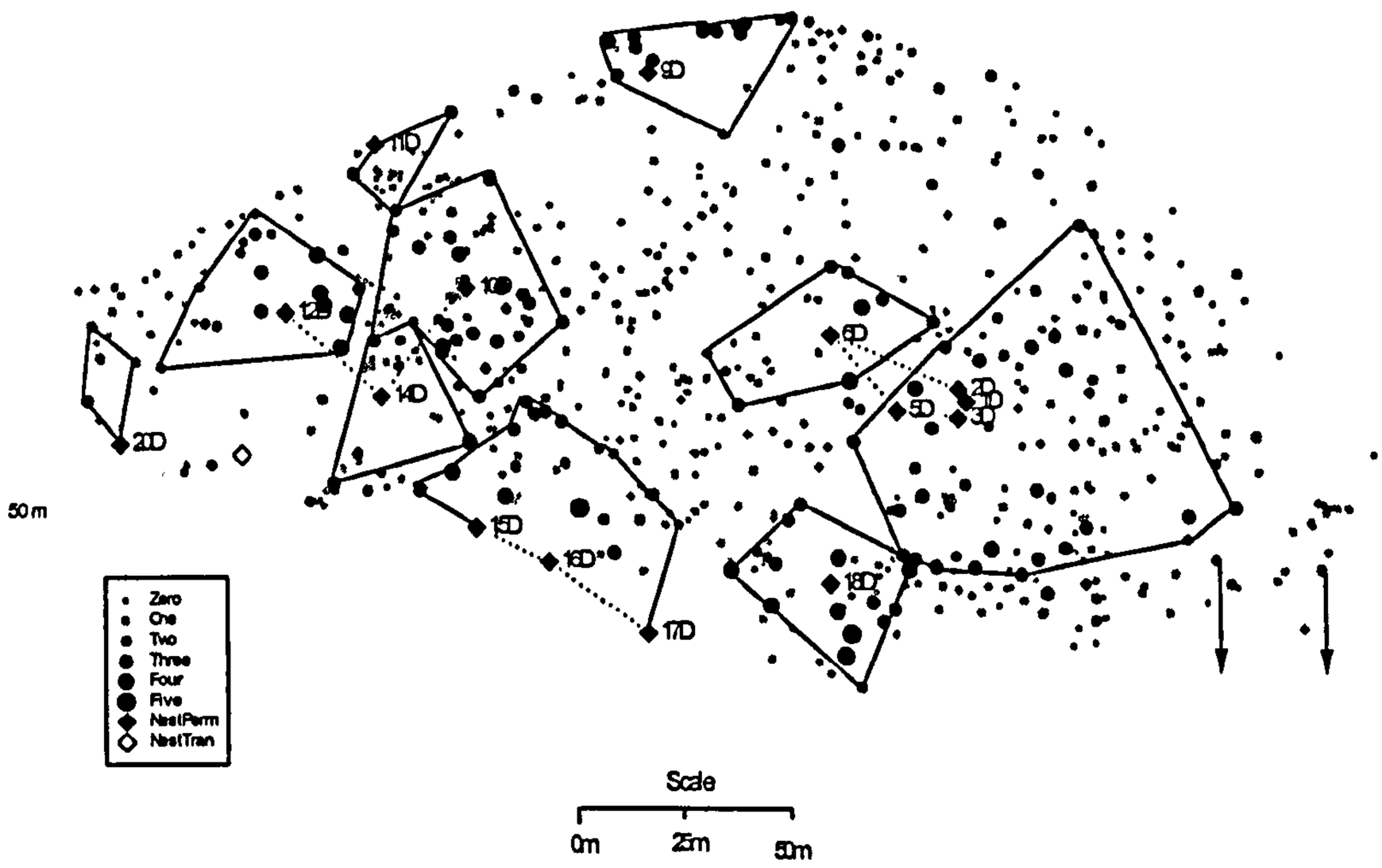
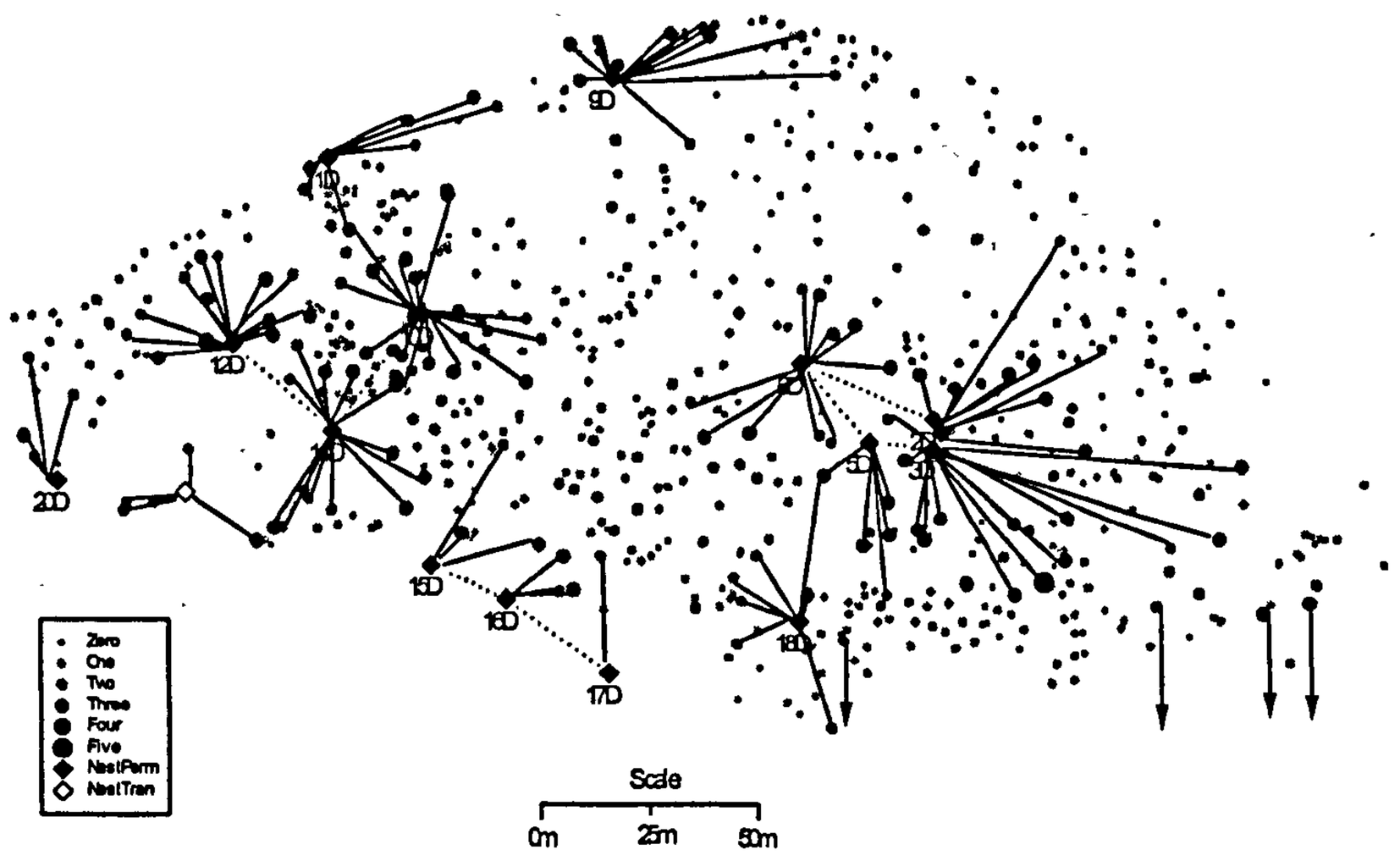


Figure 4.47: Map of foraging activity for Dimsdale whole site count for 24/05/95 a) trails to nest b) approximate boundaries

a)



b)

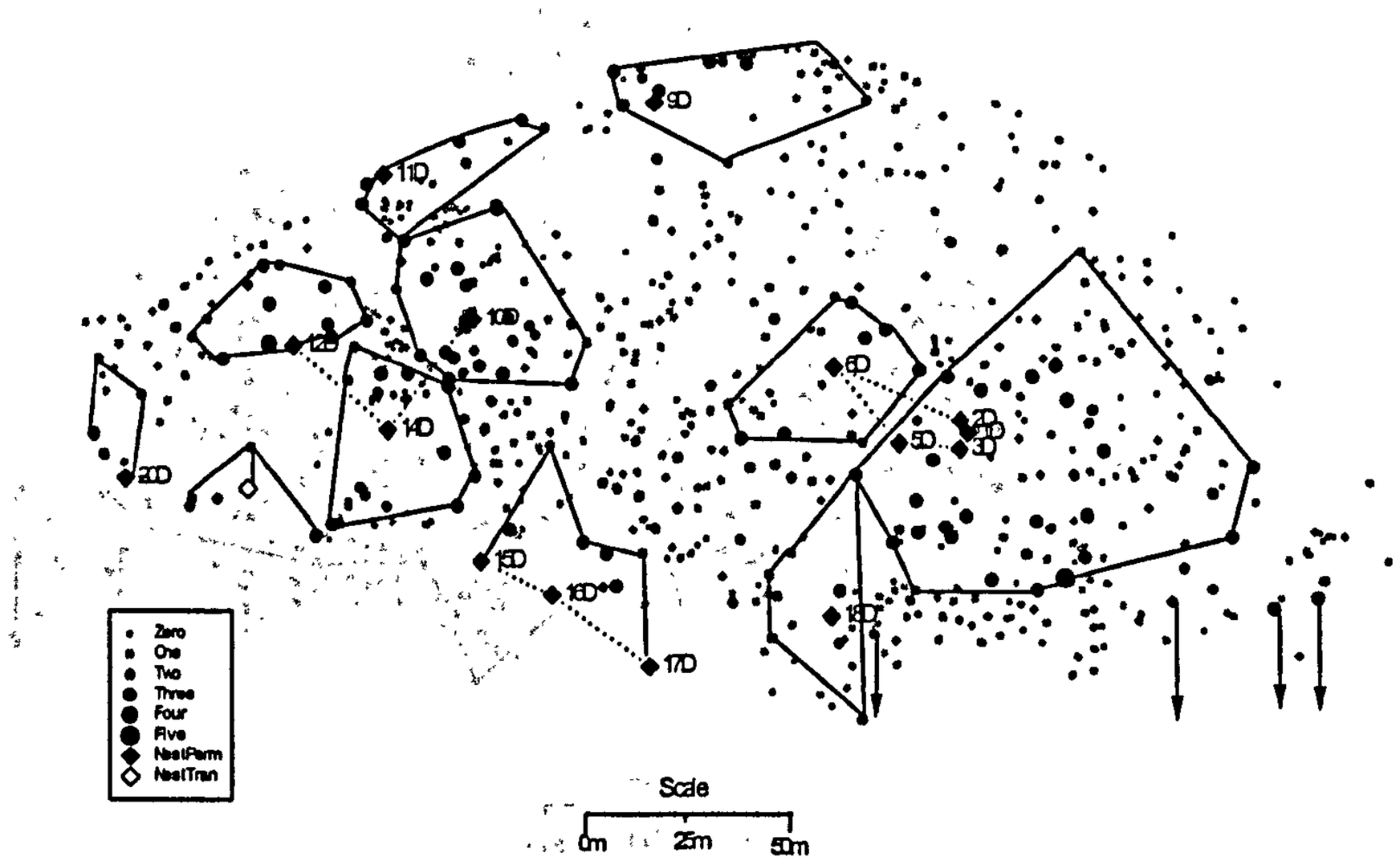
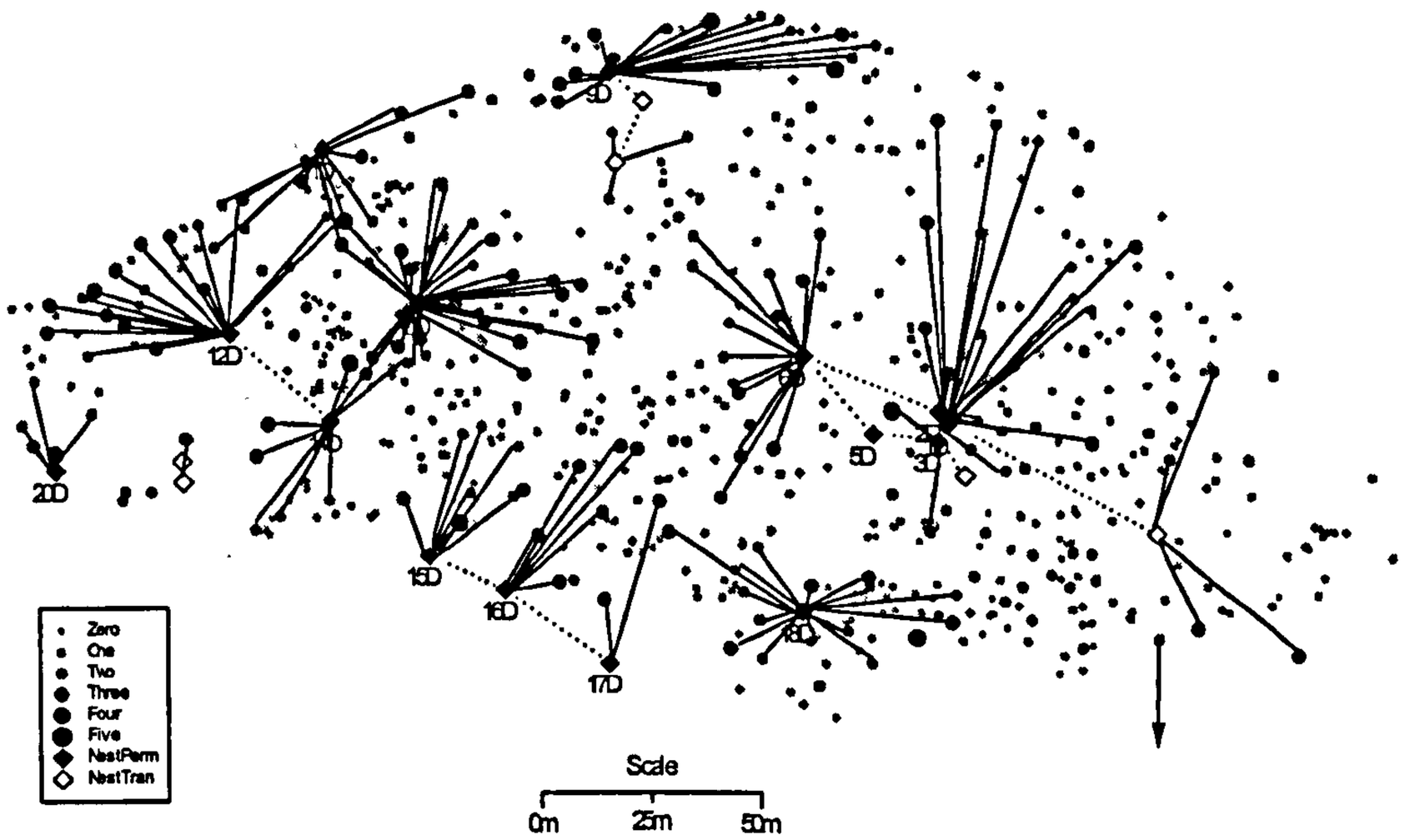


Figure 4.48: Map of foraging activity for Dimsdale whole site count for 19/07/95 a) trails to nest b) approximate boundaries

a)



b)

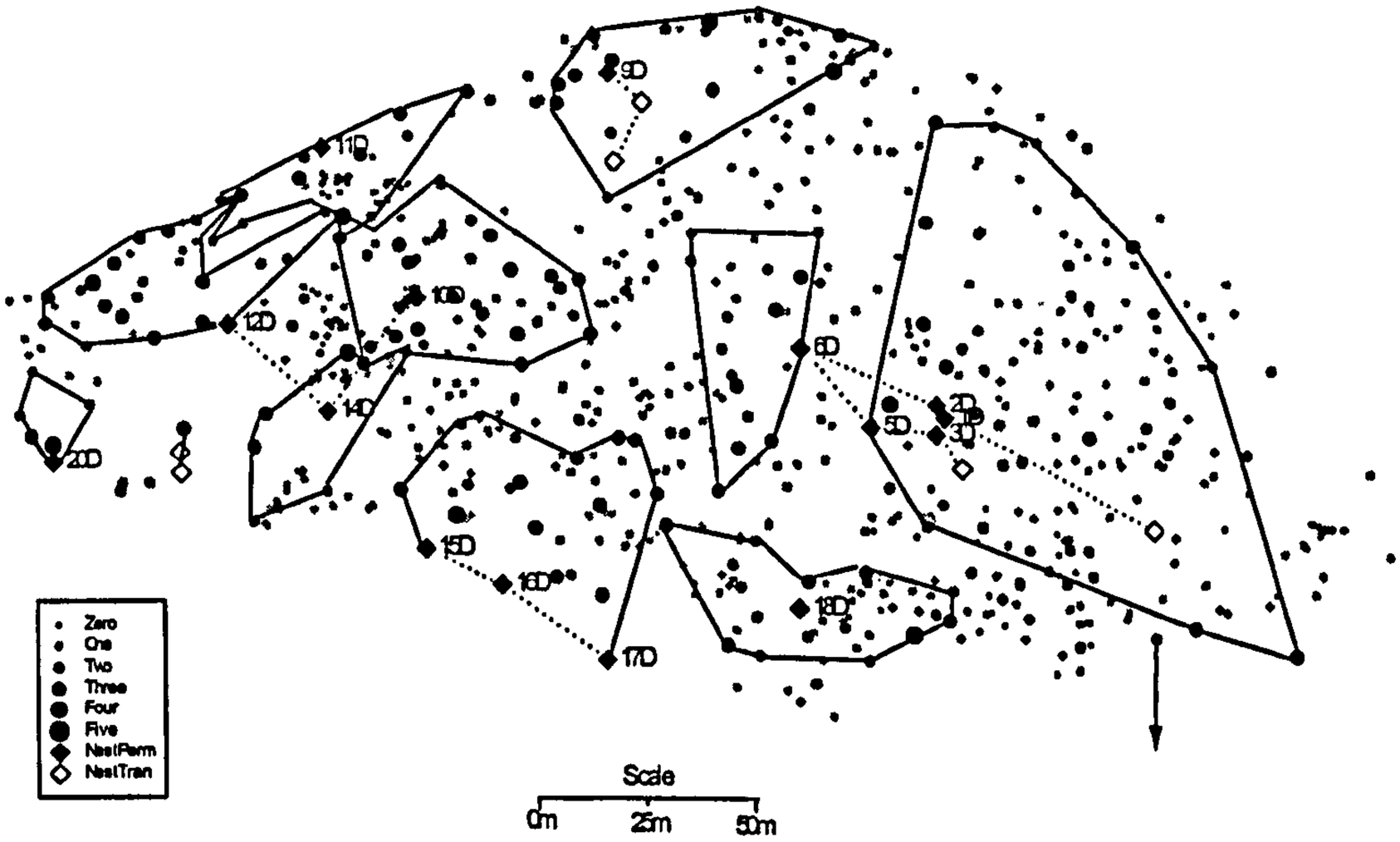
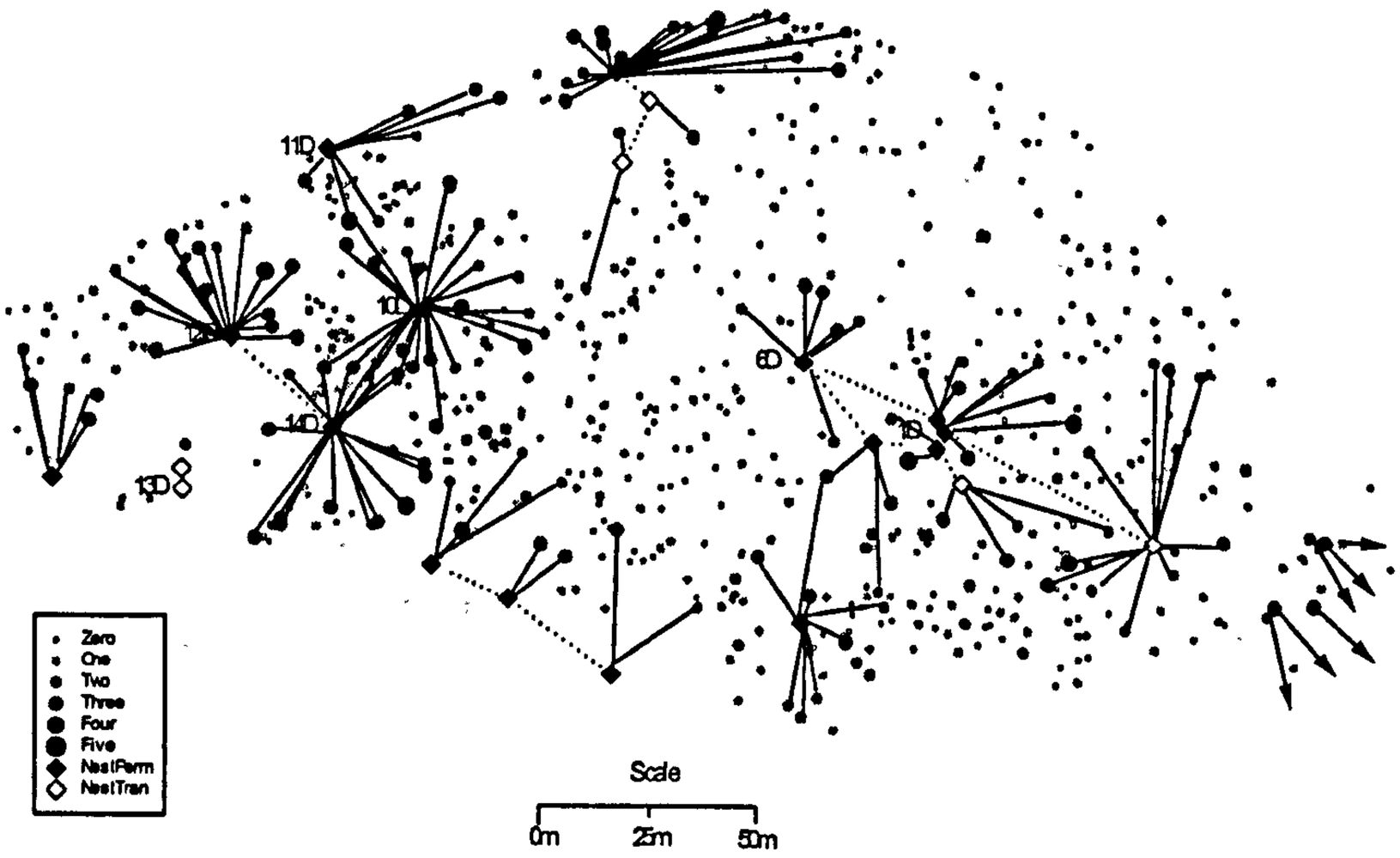


Figure 4.49: Map of foraging activity for Dimsdale whole site count for 06/09/95 a) trails to nest b) approximate boundaries

a)



b)

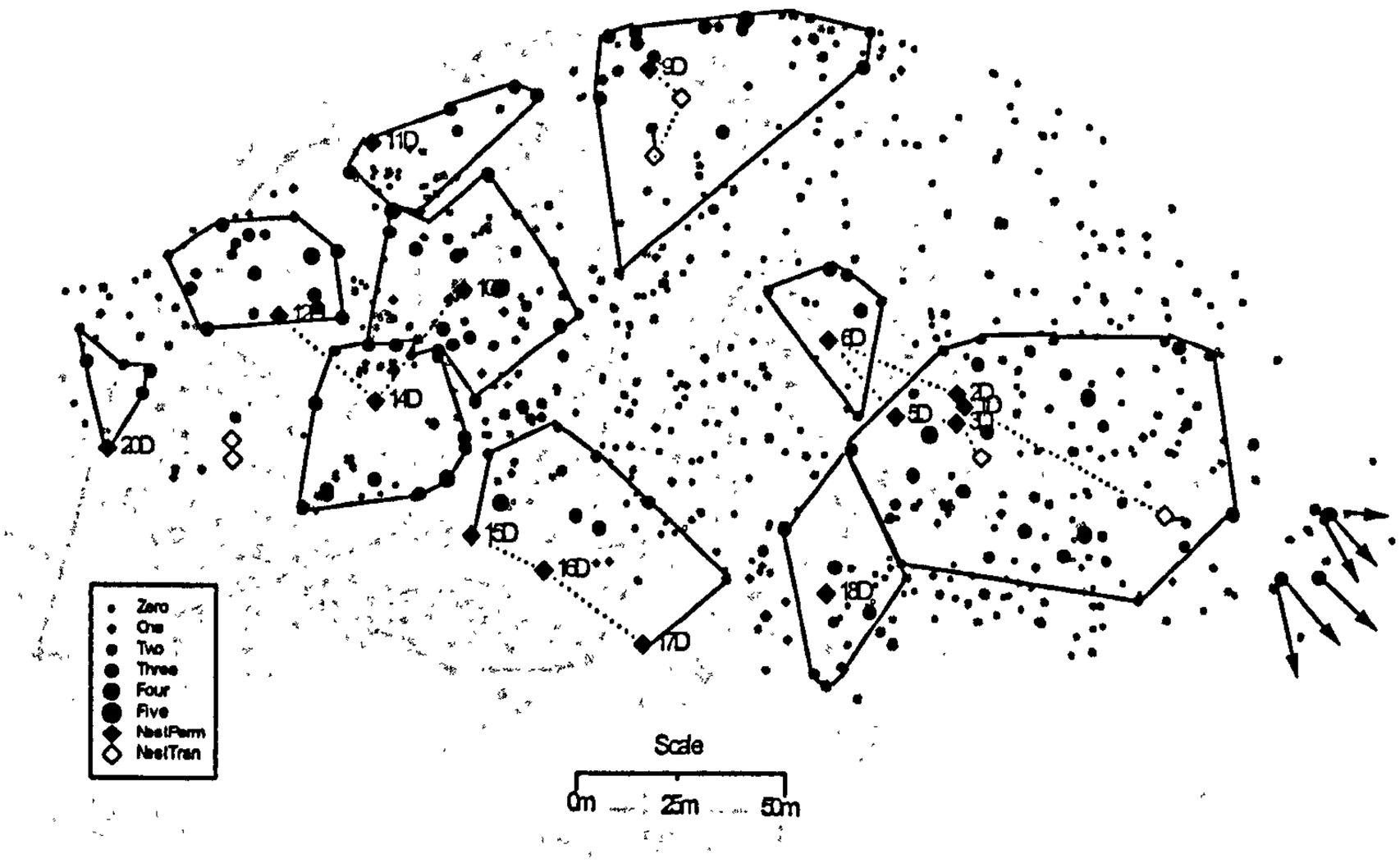


Figure 4.50: Map of foraging activity for Dimsdale whole site count for 15/11/95, trails to nest

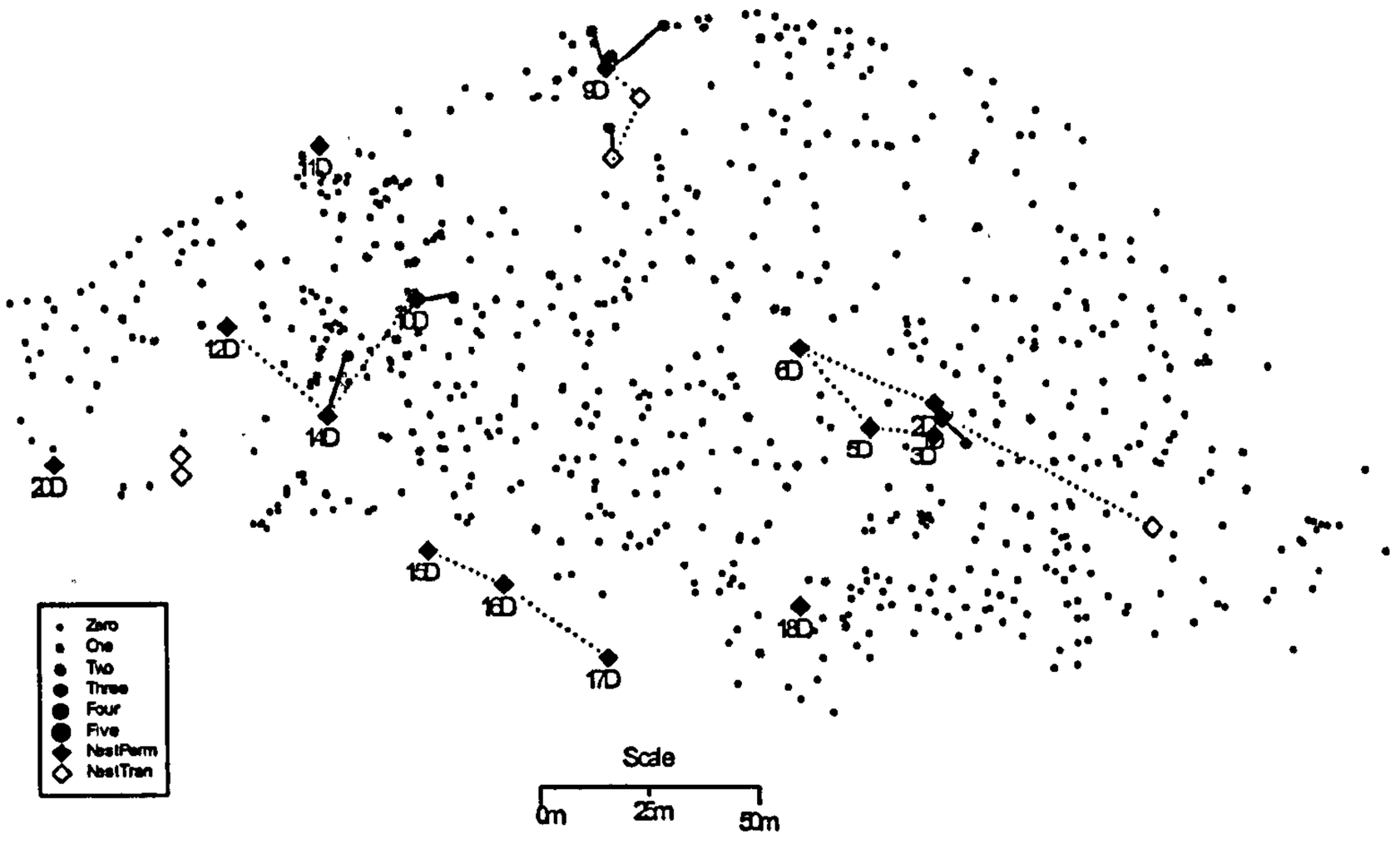


Figure 4.51: Map of foraging activity for Dimsdale whole site count for 17/04/96, trails to nest

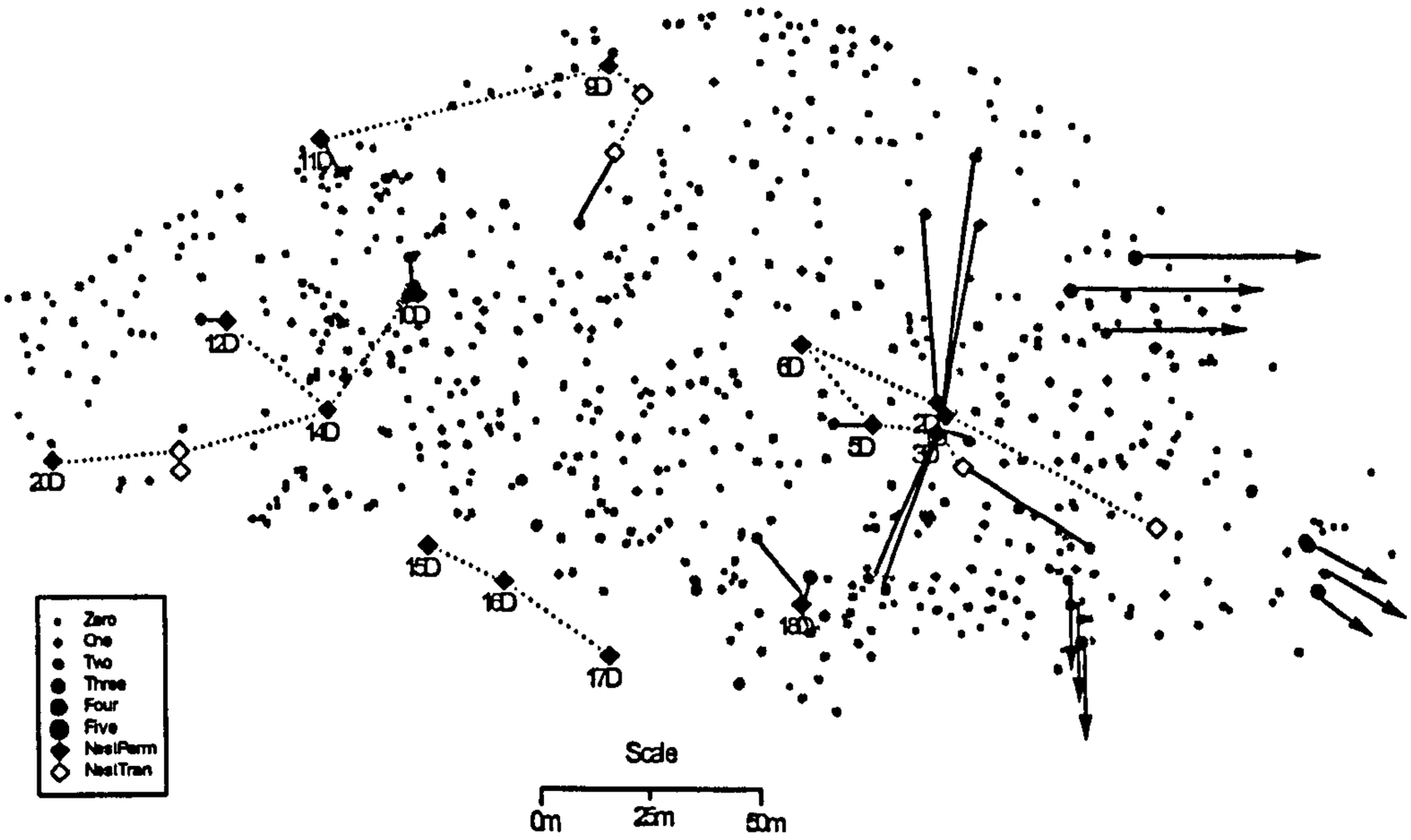
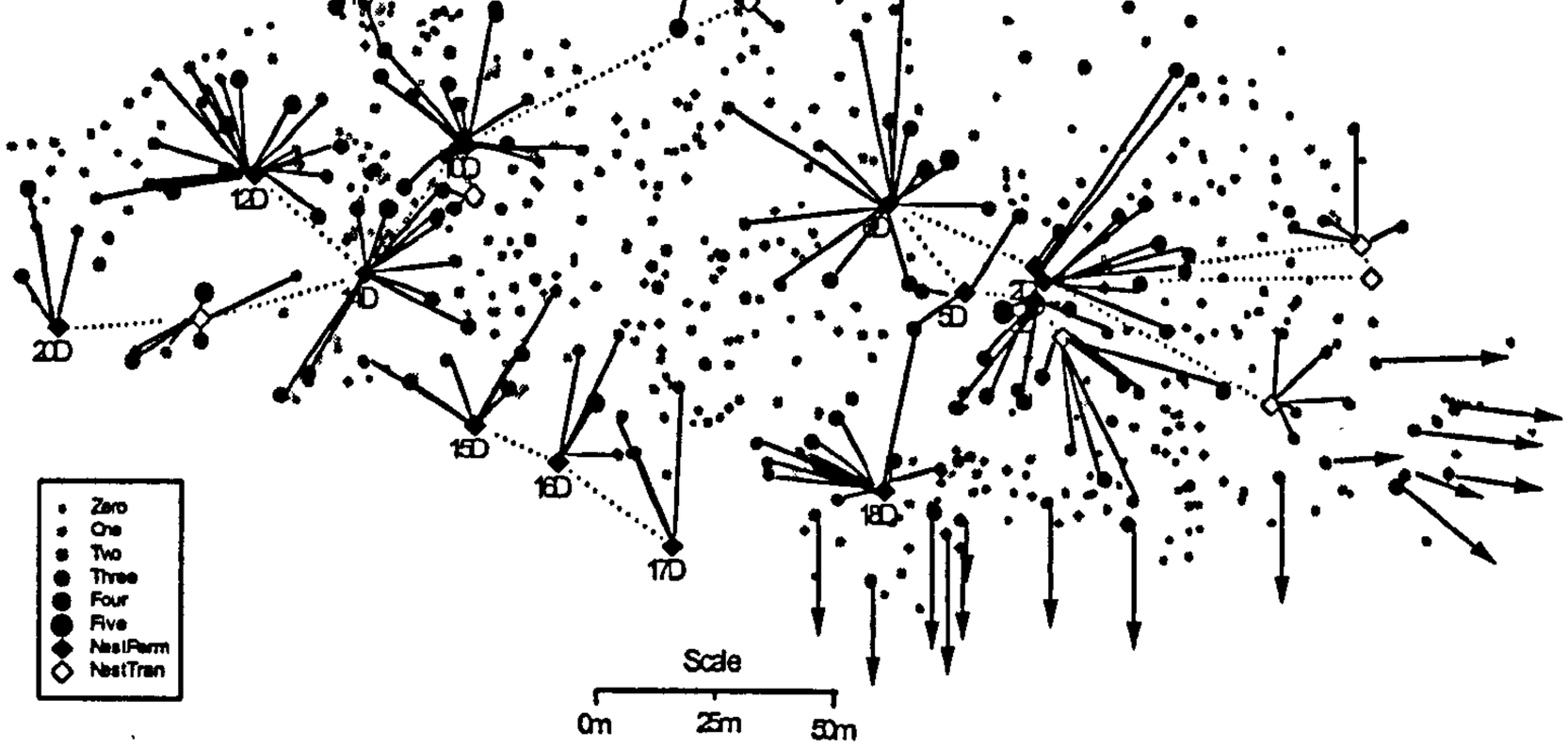
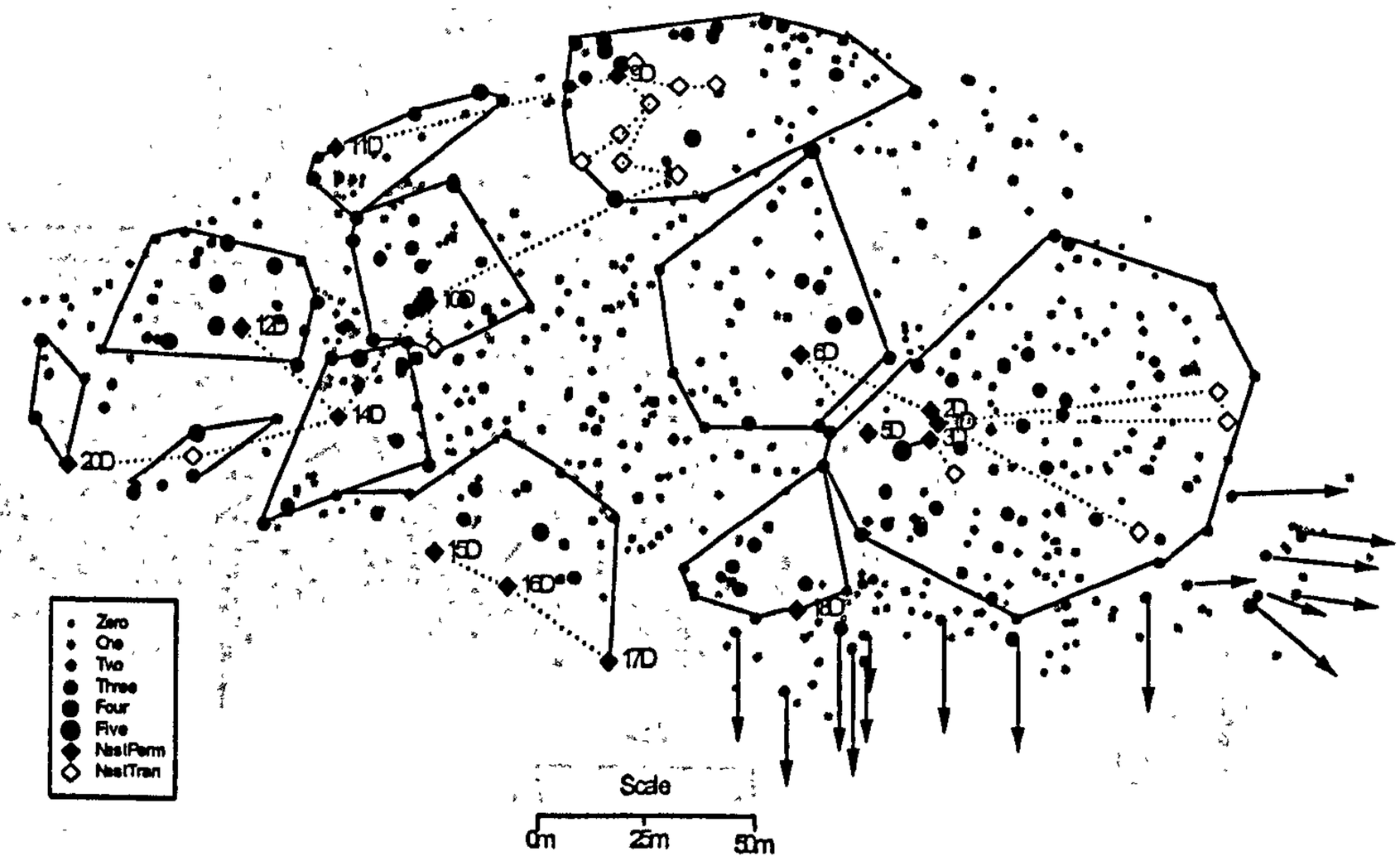


Figure 4.52: Map of foraging activity for Dimsdale whole site count for 24/06/96 a) trails to nest b) approximate boundaries

a)



b)



The observers also had to record the direction *F. rufa* was coming from. Where possible these directions are used to connect the tree with a nest. However, this information has not proved completely reliable for the following reasons:

- The assumption that *F. rufa* climbs the side of the tree nearest the nest was not always valid. For example on cold days, the direction of ascent of *F. rufa* changes so it is on the sunny side. For trees near nests, this can be corrected for, because it is obvious that this is happening. However on trees far from nests it was not always possible to tell and this could have led to mistakes.
- The observers did not always record directions. It was not possible for category 1 and not often done for category 2. Some observers had a better sense of direction than others. This problem was overcome in part by giving the observers the same set of trees each time. This led to less disorientation and improvements as time progressed.
- In general the directions recorded were of the type north or north-east; this often meant that is was difficult to tie up a tree with a nest where there are several trees close together. Unless it was unambiguous, a line was not drawn. Unfortunately this meant that it was often difficult to assign trees on the edges of foraging areas.

The number of lines drawn on the foraging abundance maps does not represent the total number of trails per nest. The lines are only drawn on the map when the nest from which *F. rufa* came is known. With interconnected nests which were close to each other, the group of nests were treated as one and the line was drawn to the nearest nest. Approximate foraging area boundaries were then drawn for each nest by drawing round the outside of the trails to trees. This foraging area is only approximate because not all heavily foraged trees (category 2 and above) could be definitely connected with a nest. Furthermore the areas between marked foraging areas were also being foraged, especially during the summer months, but activity was low and it was not possible to determine which nest the *F. rufa* workers were coming from.

The boundaries of the foraging areas could have been more accurately drawn if the nest the *F. rufa* workers were coming from could have been more accurately determined. This could have been done by placing tuna around the base of each tree, one at a time or several trees some distance apart, and following the trail back to the nest. However, this is extremely time consuming and could not be attempted on a study site containing so many trees.

Despite the problems encountered using the trails to trees method, the maps show seasonal change in foraging areas very clearly. The foraging areas vary in shape through time but the gaps between unconnected nests are maintained, for example between 10D and 6D. Foraging activity increases rapidly in the spring 1995 and quickly builds to a maximum in the summer 1995. Foraging areas decrease in September 1995 and are almost zero in November 1995. Spring 1996 was very cold and foraging areas were very small. Foraging areas in June 1996 were similar in size, although not shape, to the summer of 1994 and 1995. The foraging area of 10D does not appear to change more than that of other nests. However, its influence was greatly

extended in 1996 when it formed another nest more than 50 m away near nests 7D, 8D and 9D, which had also formed a number of new nests. There was no evidence of any hostility and all the nests appeared to be interlinked. For the first time, in 1996, a connection between nest 11D and nest 9D appeared. Nests 11D and 10D shared one oak tree throughout the study period, but there was never any direct connection between them.

From the abundance graphs, difference maps were produced by subtracting the value of a tree in one count from its value in another. Only significant changes, negative (empty circle) or positive (solid circle), are plotted. A significant change is defined as a change of 2 or more categories. This eliminates the problems of interpretation by different observers i.e. one observer could record a tree as category 1 and another observer record it as category 2, but there would be no dispute between a category 1 and a category 3. The difference maps are plotted as the values for the first date minus the values for the second date. The nests and lines from trees to nests are plotted for the first date. A reciprocal difference map was also plotted with the nests and lines for the second nest in order to give a complete picture. There are two sets of difference maps, between months, to show change on a seasonal basis and between years to show change at similar sampling times from year to year. A complete set of maps can be found in Appendix F.

These maps show how foraging areas change throughout the year (summarised in Table 4.20) and where foraging effort changes from one year to the next for matched seasons (summarised in Table 4.21). A difference map between counts at the beginning and end of the study period show changes around the experimental manipulated nest as compared to the rest of the site where food supply was unaltered. Major changes could indicate a change in the distribution and/or abundance of honeydew producing aphids or perhaps a shift in a foraging area boundary.

The foraging area of each nest where the foraging area was wholly contained within the Dimsdale site on each sampling occasion was calculated using a program written by J. Andrzej Wrotniak. Given the co-ordinates, it calculates the area of a polygon. It is available on the Internet (http://www.freeflight.com/wrotniak/polyar.html). The results are shown in Figure 4.53.

Table 4.20: Summary of the difference maps for foraging activity counts within a year for Dimsdale 1994 to 1996. Maps in Appendix F.

Figure number	Difference map	Difference in the average temperature during the foraging count / °C	Comparison of the difference between the spatial distribution of foraging activity counts within a year for Dimsdale 1994 to 1996
Figure F.1	08/94 with 07/09/94	+4	The pattern of foraging in September is similar to August but slightly reduced. The reduction in foraging is seen at the boundaries between colonies, particularly the area between 10D and 1D to 6D.
Figure F.2	12/04/95 with 24/05/95	-5	Foraging is dispersed over the whole site in April. In May foraging seems to be more consolidated. Reductions tend to be on the furthest trees from nests, for example 1D-4D and 18D.
Figure F.3	24/05/95 with 19/07/95	-4	In July there is more foraging at greater distances as compared to May. The change in pattern is partly due to the increased foraging activity on beech and a decrease on foraging activity on oak.
Figure F.4	19/07/95 with 06/09/95	+8	General decrease in foraging activity from July to September. Switch away from beech back to oak, especially around 12D.
Figure F.5	06/09/95 with 15/11/95	+4	Foraging drops to almost 0 throughout the whole site in November
Figure F.6	17/04/96 with 24/06/96	-4	An increase in foraging activity across the whole site from April to June, especially on oak (change in median value from 0 to 2)

Table 4.21: Summary of the difference maps for foraging activity counts between years for Dimsdale 1994 to 1996. Maps in Appendix F.

Figure number	Difference map	Difference in the average temperature during the foraging count / °C	Comparison of the difference between the spatial distribution of foraging activity counts between years for Dimsdale 1994 to 1996
Figure F.7	08/94 with 19/07/95	-1	The change in pattern is due to the increased foraging activity on beech and a decrease on foraging activity on oak in July 1995 as compared to August 1994.
Figure F.8	07/09/94 with 06/09/95	+1	Foraging was slightly less extensive in 1995, especially in the area around 1D-6D
Figure F.9	12/04/95 with 17/04/96	+3	April 1996 was generally a much colder month than in 1995 (Figures 3.8 and 3.9) which is reflected in the overall decrease in foraging activity in 1996 as compared with 1995, particularly on oak. The abundance of *L. roboris* on oak was much lower in 1996 (Figure 5.6) which might also be another factor in the decrease in foraging activity on oak.
Figure F.10	24/05/95 with 24/06/96	+3	Despite it being colder in June 1996 as compared to May 1995, foraging was more extensive due to the appearance of many satellites of 9D and 1D-4D.
Figure F.11	19/07/95 with 24/06/96	+7	The change in pattern is due to the increased foraging activity on beech and a decrease on foraging activity on oak in July 1995 as compared to June 1996. The temperature in July 1995 was also much higher than in June 1996
Figure F.12	08/94 with 24/06/96	+6	August 1994 was considerably hotter than June 1996, and so a general decrease in foraging is expected. The major decrease is a decrease in foraging on oak, though there was a slight increase on silver birch. The foraging seems closer to the nests in June 1996 compared with August 1994.

Taking the foraging area of 7th September 1994 as a reference point, the relative change in area for each nest can be calculated (Table 4.22). This shows more clearly seasonal change. Generally foraging areas increase from 12th April 1995 to a maximum on 19th July 1995 and decrease to a minimum on 15th November 1995. There are some exceptions: two nests, 9D and 14D had their maximum foraging areas on 6th September 1995, and the very cold spring of 1996 meant a number of foraging areas were still zero on 17th April 1996.

Figure 4.53: Changes in foraging areas for nests wholly contained within Dimsdale

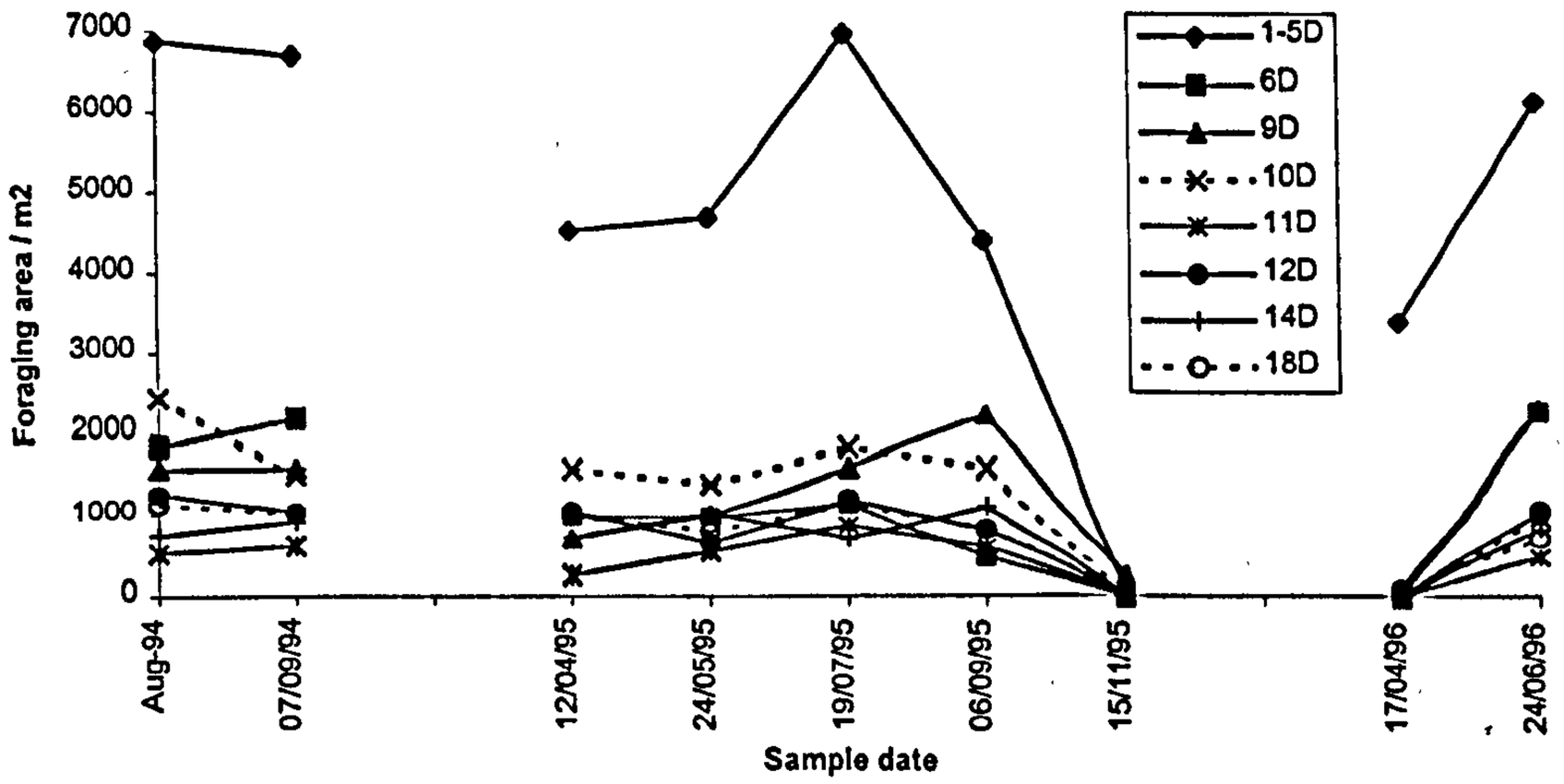


Table 4.22: Relative change in foraging areas for nests wholly contained within Dimsdale

	1-5D	6D	9D	10D	11D	12D	14D	18D
07/09/94	1	1	1	1	1	1	1	1
12/04/95	0.68	0.45	0.42	1.05	0.40	1.03	0.78	0.99
24/05/95	0.70	0.46	0.63	0.93	0.87	0.61	1.17	0.79
19/07/95	1.04	0.54	0.10	1.20	1.53	1.21	0.8	1.18
06/09/95	0.66	0.22	1.37	1.05	1.02	0.83	1.32	0.87
15/11/95	0.004	0	0.15	0	0	0	0	0
17/04/96	0.51	0	0.06	0.002	0	0	0	0.08
24/06/96	0.92	1.05	1.43	0.70	0.85	1.10	1.02	0.76

Despite the clear general pattern, it can be seen that there is a wide variation in the individual nest foraging area changes. This makes it very difficult to assess whether the supplemental feeding of 10D had any significant effect. In 1995, when the feeding began, 10D was almost consistently larger than its September 1994 value, and even in

May 1995, it is close to the September 1994 value, whilst most other nests are significantly smaller than it. However, the increases of 10D over the September 1994 value are well within the largest changes experienced by other nests.

The June 1996 value is the lowest of all the nests. One possible explanation for this is the large number of workers committed at this time to the formation of the satellite nest 21D.

Table 4.23 shows the number of beech, oak and silver birch trees contained within each foraging area of the permanent nests wholly contained within Dimsdale. The average relative proportions of trees varies considerably from nest to nest, for example the foraging areas of nests 1-5D contain more beech than oak, whilst 18D has far more oak than beech.

Most of the nests show their largest numbers of beech in July 1995. From section 4.3.2.1, it has been seen that at this time there was a sharp drop in the heavy foraging of oak, and a corresponding increase in heavy foraging on beech. The results here indicate that this was not just a switch to beech trees within the existing foraging area, but a reorientation of the foraging area to include more beech trees. With some nests, especially 6D and 12D, this reorientation leads to a decrease of the number of oaks within the foraging areas.

Table 4.24 shows the percentage of available trees within each foraging area foraged at category 1 or above for the same nests as above. The predominance of foraging on oak over beech is again seen, with very high percentages of oak foraged. The maximum foraging effort on beech tends to occur in July 1995 (the figures for November 1995 can be a little misleading, because there may only be one tree in the foraging area and therefore the percentage value will be 0 or 100 %).

Table 4.25 shows the mean distance to actively foraged beech trees (abundance category 1 or above and abundance category 3 or above) within a nest foraging area for each sample date. Blanks cells in the table indicate that there were no trees of that species recorded as foraged at that abundance category or above on that date. Table 4.26 shows the data for actively foraged oak trees. The values for nests 1-5D in both tables may be misleading as it was impossible to know which nest in the complex the foragers had come from, therefore all measurements were taken from the tree to nest 1D.

The mean distance to foraged beech varies between 11.3 m and 31.2 m for abundance category 1 and above and 10.5 m and 29.0 m for abundance category 3 and above. The mean distance for abundance category 1 and above varies between 16.3 m and 38.8 m, 15.3 m and 35.9 m for abundance category 3 and above. Overall, the average distance travelled to a beech tree was 21 m and 21m to an oak tree for abundance category 1 or above. For abundance category 3 or above, the average distance travelled to a beech tree was 17 m and 21 m to an oak tree.

Table 4.23: Number of beech, oak and silver birch trees in the foraging area of nests wholly contained within Dimsdale

Date	1-5D			6D			9D			10D		
	Beech	Oak	Silver birch	Beech	Oak	Silver birch	Beech	Oak	Silver birch	Beech	Oak	Silver birch
08/94	84	78	6	14	25	0	15	21	0	32	44	35
07/09/94	93	82	5	14	14	0	15	22	0	22	31	28
12/04/95	74	49	5	7	10	0	3	13	0	23	32	31
24/05/95	75	45	5	7	12	0	10	17	0	20	31	23
19/07/95	88	55	6	16	7	0	18	20	0	25	30	23
06/09/95	61	52	3	3	10	0	21	24	1	25	32	27
15/11/95	1	0	1	0	0	0	1	6	0	0	1	0
17/04/96	43	32	5	0	0	0	1	2	1	7	1	18
24/06/96	94	65	5	16	21	0	30	25	0	17	19	23

Date	11D			12D			14D			18D		
	Beech	Oak	Silver birch	Beech	Oak	Silver birch	Beech	Oak	Silver birch	Beech	Oak	Silver birch
08/94	5	6	12	13	17	0	9	12	8	2	26	1
07/09/94	5	9	22	8	17	0	10	17	9	2	22	1
12/04/95	3	7	12	6	16	0	7	8	9	3	32	1
24/05/95	5	8	12	3	14	0	8	16	10	2	18	0
19/07/95	8	10	15	19	11	0	10	16	9	7	42	1
06/09/95	5	9	19	7	13	0	10	22	10	2	20	1
15/11/95	0	0	0	0	0	0	1	0	1	0	0	0
17/04/96	0	0	10	0	1	0	0	0	0	0	4	0
24/06/96	5	8	14	9	17	0	12	21	9	1	22	0

Table 4.24: Percentage of available beech, oak and silver birch trees foraged at count 1 or above within nest foraging areas wholly contained within Dimsdale

na = none available

Date	1-5D			6D			9D			10D		
	Beech	Oak	Silver birch	Beech	Oak	Silver birch	Beech	Oak	Silver birch	Beech	Oak	Silver birch
08/94	38	81	50	64	80	na	80	90	na	50	93	29
07/09/94	31	80	60	29	100	na	27	95	na	64	97	29
12/04/95	50	90	80	100	100	na	100	92	na	52	97	45
24/05/95	51	96	80	86	100	na	80	94	na	60	100	48
19/07/95	82	89	83	100	100	na	100	95	na	76	97	61
06/09/95	25	85	67	33	90	na	43	88	100	52	91	33
15/11/95	100	na	0	na	na	na	0	100	na	na	100	na
17/04/96	53	69	60	na	na	na	0	50	100	43	100	56
24/06/96	48	91	60	75	100	na	77	100	na	35	100	52

Date	11D			12D			14D			18D		
	Beech	Oak	Silver birch	Beech	Oak	Silver birch	Beech	Oak	Silver birch	Beech	Oak	Silver birch
08/94	40	67	8	92	100	na	44	75	13	50	88	0
07/09/94	80	89	14	50	100	na	30	88	11	50	91	0
12/04/95	67	100	33	67	100	na	43	100	44	100	91	0
24/05/95	80	88	17	100	100	na	75	100	40	100	100	na
19/07/95	100	90	40	100	100	na	80	100	78	100	98	0
06/09/95	80	78	5	86	100	na	30	91	30	0	70	0
15/11/95	na	na	na	na	na	na	100	na	0	na	na	na
17/04/96	na	na	50	na	100	na	na	na	na	na	100	na
24/06/96	60	88	43	78	100	na	67	95	78	100	100	na

Table 4.25: Mean distance (m) to foraged beech trees contained within nest foraging areas at Dimsdale

Date	Abundance category 1 or above								Abundance category 3 or above							
	1-5D	6D	9D	10D	11D	12D	14D	18D	1-5D	6D	9D	10D	11D	12D	14D	18D
15/08/94	31.3	18.4	30.2	19.8	20.5	30.4	20.7	9.8	14.0			20.8			14.3	
07/09/94	38.0	24.8	14.2	13.8	20.5	30.4	12.3	9.8	7.8						14.5	
12/04/95	33.3	14.4	22.1	14.7	12.5	24.6	12.6	11.0	22.8	12.0	7.5					
24/05/95	34.0	14.0	35.6	14.4	20.5	22.8	11.7	7.8			7.5				14.5	
19/07/95	40.4	22.7	37.3	17.4	20.9	30.3	19.2	19.5	49.9	22.0	14.2	19.6	15.7	31.9	15.9	26.6
06/09/95	30.3	10.6	26.6	17.4	20.5	25.1	12.5		7.8		13.5	20.8		26.1	14.3	
15/11/95	7.8						14.5									
17/04/96	25.7			6.4												
24/06/96	40.2	22.3	33.8	12.2	20.5	27.0	20.3	9.8	14.0		9.5				14.5	
Mean	31.2	18.2	28.5	14.5	19.4	27.2	11.3	9.7	19.4	17.0	10.5	20.4	15.7	29.0	14.7	26.6

Table 4.26: Mean distance (m) to foraged oak trees contained within nest foraging areas at Dimsdale

Date	Abundance category 1 or above								Abundance category 3 or above							
	1-5D	6D	9D	10D	11D	12D	14D	18D	1-5D	6D	9D	10D	11D	12D	14D	18D
15/08/94	40.4	26.7	27.3	21.1	26.8	21.2	22.0	16.0	38.9	26.2	25.8	19.3	26.8	21.2	22.2	17.1
07/09/94	43.0	24.3	26.5	17.5	18.7	18.3	21.9	15.0	41.6	22.4	24.8	15.1	22.0	15.7	22.3	12.8
12/04/95	36.8	18.8	17.7	17.7	11.5	17.6	19.4	16.3	36.3	16.4	16.5	17.5	15.6	13.5	23.9	15.5
24/05/95	36.9	17.8	24.5	17.7	18.4	16.6	20.2	16.3	31.8	19.2	14.2	16.9	17.7	13.9	20.7	20.4
19/07/95	43.2	20.9	27.6	21.4	18.3	17.8	21.3	19.4	40.1	17.2	25.6	23.4	22.1	11.6		22.4
06/09/95	37.8	15.8	28.1	18.1	20.7	16.1	21.1	16.6	32.9	32.9	19.4	17.9	26.8	16.0	22.7	17.6
15/11/95			9.9	8.5							3.2					
17/04/96	31.0		3.2	8.6		5.8		12.5								6.5
24/06/96	41.0	22.8	29.1	17.3	18.4	16.8	21.1	19.0	29.4	19.4	26.0	17.8	26.8	15.2	21.5	18.2
Mean	38.8	21.0	21.6	16.4	19.0	16.3	21.0	16.4	35.9	22.0	19.4	18.3	22.6	15.3	22.2	16.3

To determine whether there was a significant difference between the mean distance travelled to beech trees as compared to oak trees during the study period a Mann-Whitney *U* test was performed for abundance category 1 or above (Table 4.27) and abundance category 3 or above (Table 4.27). A nonparametric measure was used as no assumption about the shape of the distribution had to be made (Siegel 1956).

Table 4.27: Mann-Whitney *U* test for differences between the mean distance travelled to beech and oak trees in Dimsdale throughout the study period 1994 to 1996

*** Significant at 0.001, ns = not significant.

Mean distance travelled to beech and oak trees	*U*	z	Significance
Abundance category 1 or above	1822	-0.2	ns
Abundance category 3 or above	1764	-3.4	***

The results show that there is no significant difference in the distance travelled to beech trees as compared to oak trees at abundance category 1 or above. There is a significant difference in the distance travelled at abundance category 3 or above. For heavily foraged oak trees, workers travel further than for heavily foraged beech trees. Table 4.25 and Table 4.26 show that there are fewer heavily foraged beech trees than oak trees.

4.3.4.2 Halse

4.3.4.2.1 Patterns of foraging activity in trees

The biggest changes occur seasonally within each year. These changes can more easily be seen by charting the increases and decreases in the median values for whole site foraging activity throughout the year (Figure 4.54 to Figure 4.57). This is summarised in Table 4.28.

Figure 4.54: Median values, with upper and lower quartiles, of foraging activity on beech for Halse whole site counts for 1994 to 1996

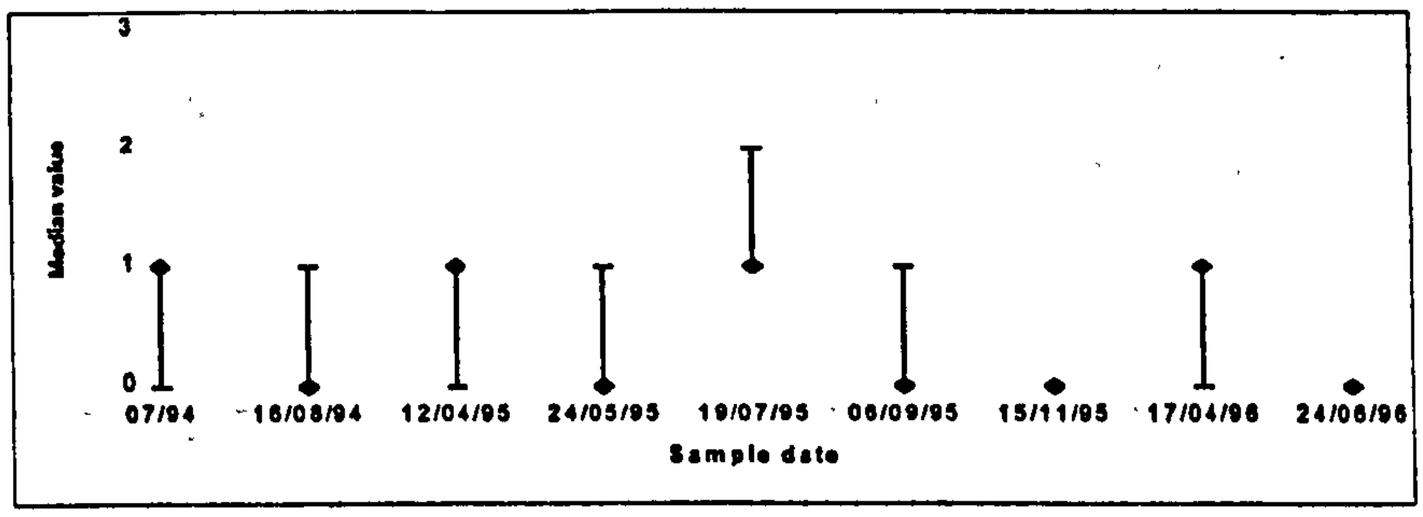


Figure 4.55: Median values, with upper and lower quartiles, of foraging activity on oak for Halse whole site counts for 1994 to 1996

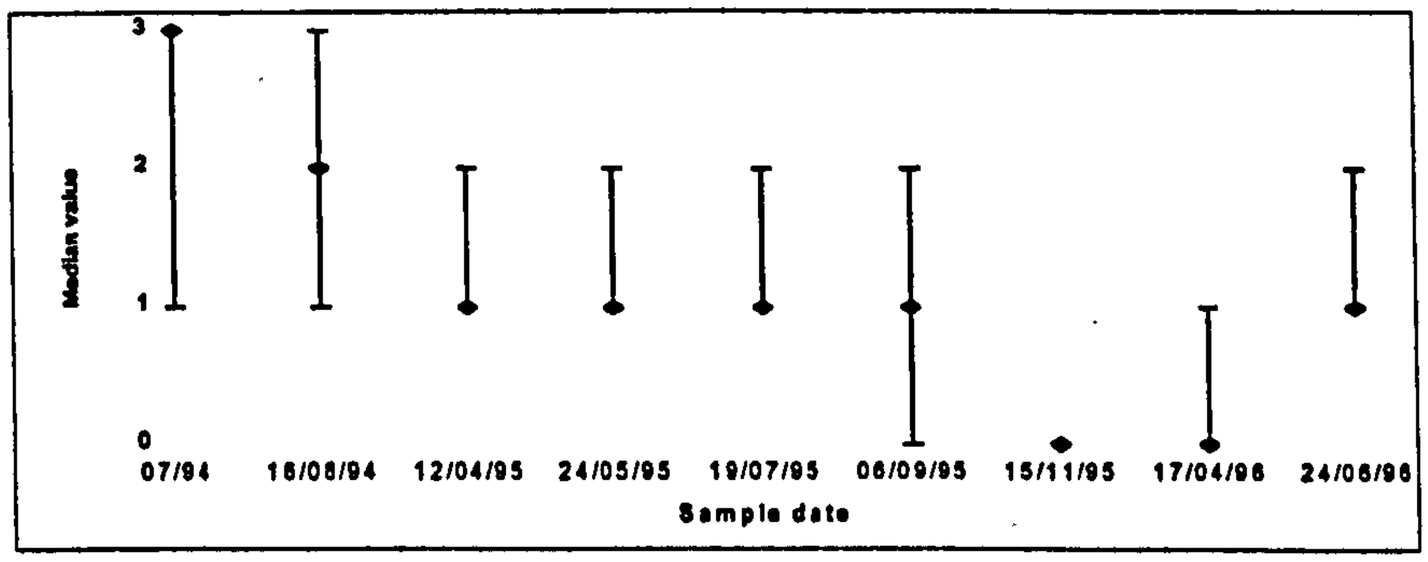


Figure 4.56: Median values, with upper and lower quartiles, of foraging activity on silver birch for Halse whole site counts for 1994 to 1996

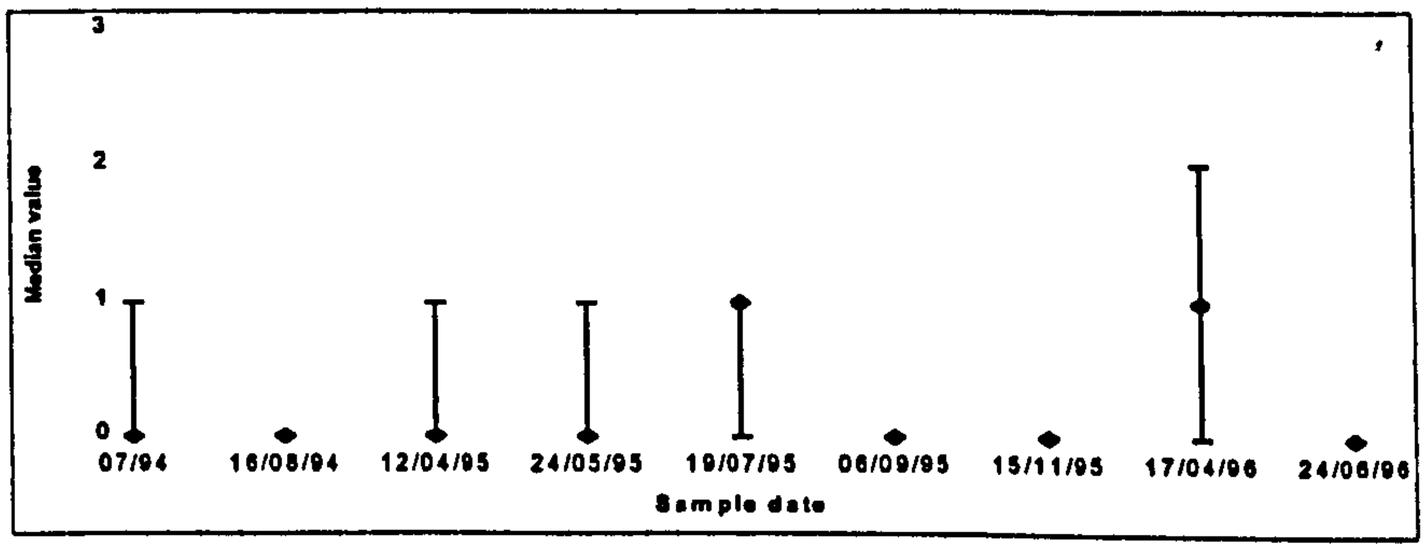


Figure 4.57: Median values, with upper and lower quartiles, of foraging activity on miscellaneous trees Halse for whole site counts for 1994 to 1996

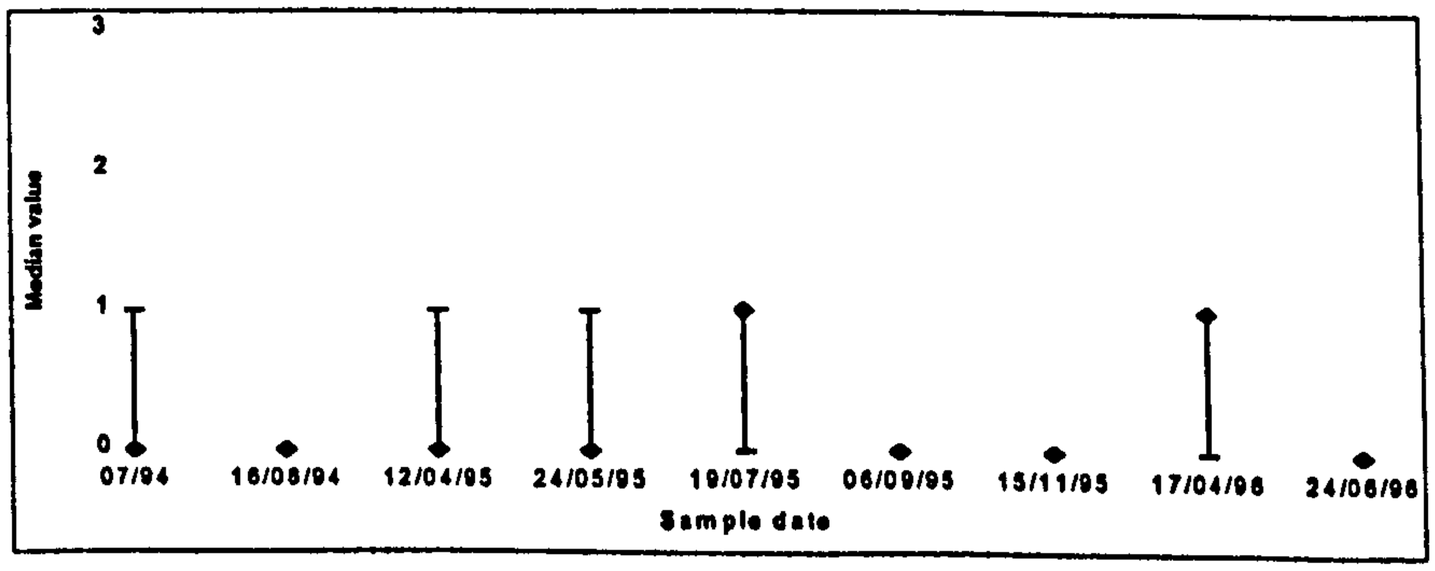


Table 4.28: Summary of the changes in median values of whole site foraging activity counts for Halse 1994 to 1996

Sample Date	Average temperature during the foraging count / °C	Comparison of median values, upper and lower quartiles of whole site foraging activity counts for Halse 1994 to 1996
07/94	19	The median value of 3 for oak was at a peak for the study period. Beech had a median value of 1. Silver birch and miscellaneous trees had upper quartiles of 1.
16/08/94	22	Foraging activity decreased across all trees for August 1994, compared to July 1994.
12/04/95	16	The median values for beech and oak were the same, but foraging activity was slightly higher on oak with an upper quartile of 2 as compared to 1 for beech. Silver birch and miscellaneous trees had upper quartiles of 1
24/05/95	16	Foraging activity on oak, silver birch and miscellaneous trees was the same as for April 1995. Beech was lower with the median value dropping from 1 to 0.
19/07/95	24	Beech reached a peak for the study period with an upper quartile of 2. Foraging activity on silver birch and miscellaneous trees also increased from May to July with a change in median values of 0 to 1. Oak was unchanged.
06/09/95	18	There is a general decrease activity from July to September with the median values of beech, silver birch and miscellaneous trees dropping from 1 to 0. The lower quartile of oak dropped from 1 to 0.
15/11/95	11	Activity across the whole site is 0.
17/04/96	14	Foraging activity on silver birch reaches a peak for the study period with an upper quartile of 2. The median value for oak is lower in April 1996 than in April 1995. The abundance of *L. roboris* on oak was much lower in 1996 (Figure 5.6) which might be a factor in the decrease in foraging activity on oak. Miscellaneous trees reaches a peak for the study period with a median value of 1. Foraging activity on beech is the same as in April 1995.
24/06/96	18	Foraging activity on oak from April 1996 to June 1996 increased with a change in median values from 0 to 1. There was a decrease in foraging activity from April to June for all other trees with a decrease of median values from 1 to 0.

In order to investigate whether the intensity of foraging was related to the size of the tree, the abundance category for each tree was correlated with the tree's girth. Spearmans Rank Correlation was used. A nonparametric measure was used as no assumption about the shape of the distribution had to be made and the abundance data was categorical (Siegel 1956). The results are presented in Table 4.29 for beech, oak and silver birch for each whole site sampling date. A large number of correlations were positive and highly significant, indicating that larger trees are more heavily foraged than smaller trees.

Table 4.29: Correlation of abundance of *Formica rufa* against tree girth for oak, beech and silver birch for Halse whole site counts

* = significant at 0.05, ** = significant at 0.01, *** = significant at 0.001, ns = not significant

	Beech			Oak			Silver birch		
Sample date	n	*r*	Sig.	n	*r*	Sig.	n	*r*	Sig.
16/08/94	235	0.33	***	218	0.52	***	95	0.32	**
12/04/95	235	0.37	***	223	0.25	***	95	0.23	**
24/05/95	234	0.17	**	225	0.40	***	95	0.28	**
19/07/95	234	0.40	***	225	0.37	***	94	-0.001	ns
06/09/95	234	0.22	**	225	0.49	***	95	0.18	ns
15/11/95	236	-0.01	ns	225	0.23	**	95	0.15	ns
17/04/96	235	0.15	**	224	0.21	**	95	0.58	***
24/06/96	236	0.24	***	225	0.43	***	95	0.36	***

For every sample, except 19th July 1995, oak has the highest percentage of available trees foraged, which indicates its importance as a source of food. Beech and silver birch are the second and third most popular choices. The values for July 1995 represent the maximum foraging effort with the percentage of available trees left unforaged at its lowest point for all tree species (Table 4.30).

4.3.4.2.2 Changes in foraging areas

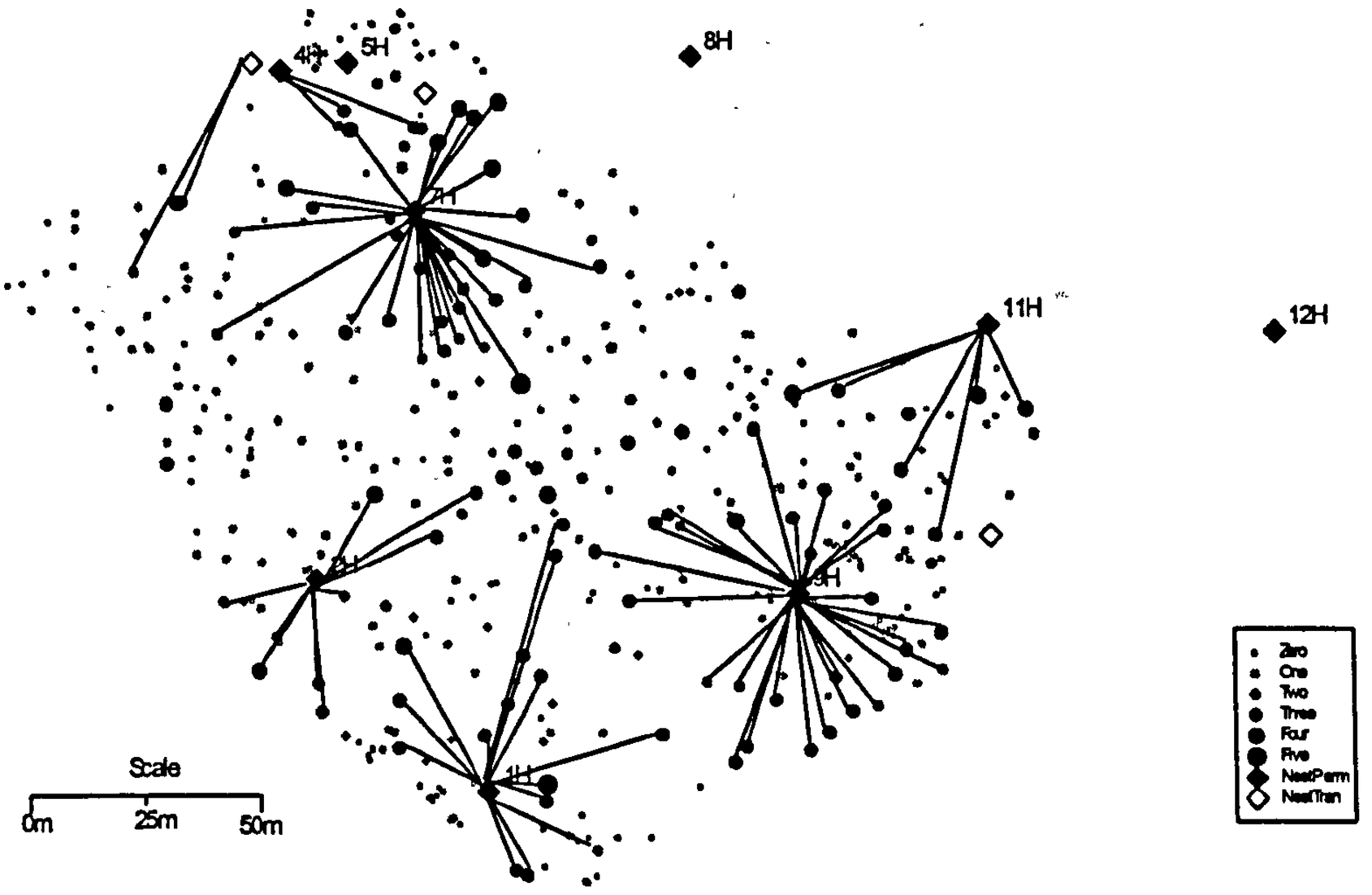
The first map for Halse uses values collected as each tree was labelled which took place over two days (27th and 29th July 1994). Maps showing abundance scores for individual trees on each sampling date were plotted (Figure 4.58 to Figure 4.66) as described in section 4.3.4.1.2. The data is shown in Appendix G. From these graphs, difference maps were produced as described in section 4.3.4.1.2. The difference maps for between months (Appendix G) are summarised in Table 4.31. The difference maps for between years (Appendix G) are summarised in Table 4.32.

Table 4.30: Percentage of available trees foraged for each scale of abundance value for each sampling date in Halse

	Scale of abundance	Jul-94	16/08/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
Beech	0	42.3	55.7	45.9	56.3	9.8	63.7	94.3	46.7	58.3
	1	49.8	36.6	49.6	41.2	55.5	31.0	5.3	47.2	38.1
	2	5.1	7.3	4.5	2.0	25.3	4.1	0.4	6.1	3.6
	3	2.8	0.4	0.0	0.4	9.4	1.2	0.0	0.0	0.0
	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oak	0	7.7	13.2	12.5	19.9	10.2	33.6	88.1	52.0	22.1
	1	25.0	27.4	43.8	47.8	55.3	28.8	9.7	38.7	35.0
	2	14.7	32.4	20.5	21.2	26.5	21.2	2.2	5.8	21.2
	3	40.4	23.7	19.6	10.6	7.5	15.9	0.0	3.1	21.2
	4	10.9	3.2	3.1	0.4	0.4	0.4	0.0	0.0	0.4
	5	1.3	0.0	0.4	0.0	0.0	0.0	0.0	0.4	0.0
Silver birch	0	62.7	76.9	64.4	62.5	30.1	82.7	96.2	39.4	79.8
	1	33.3	23.1	26.9	32.7	65.0	17.3	3.8	32.7	15.4
	2	2.7	0.0	7.7	3.8	3.9	0.0	0.0	24.0	3.8
	3	1.3	0.0	0.0	1.0	1.0	0.0	0.0	3.8	1.0
	4	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miscellaneous	0	82.6	82.1	42.9	50.0	32.1	75.0	92.9	42.9	78.6
	1	17.4	17.9	42.9	32.1	60.7	17.9	3.6	35.7	21.4
	2	0.0	0.0	14.3	17.9	7.1	3.6	3.6	17.9	0.0
	3	0.0	0.0	0.0	0.0	0.0	3.6	0.0	3.6	0.0
	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Figure 4.58: Map of foraging activity for Halse whole site count for 07/94 a) trails to nest b) approximate boundaries

a)



b)

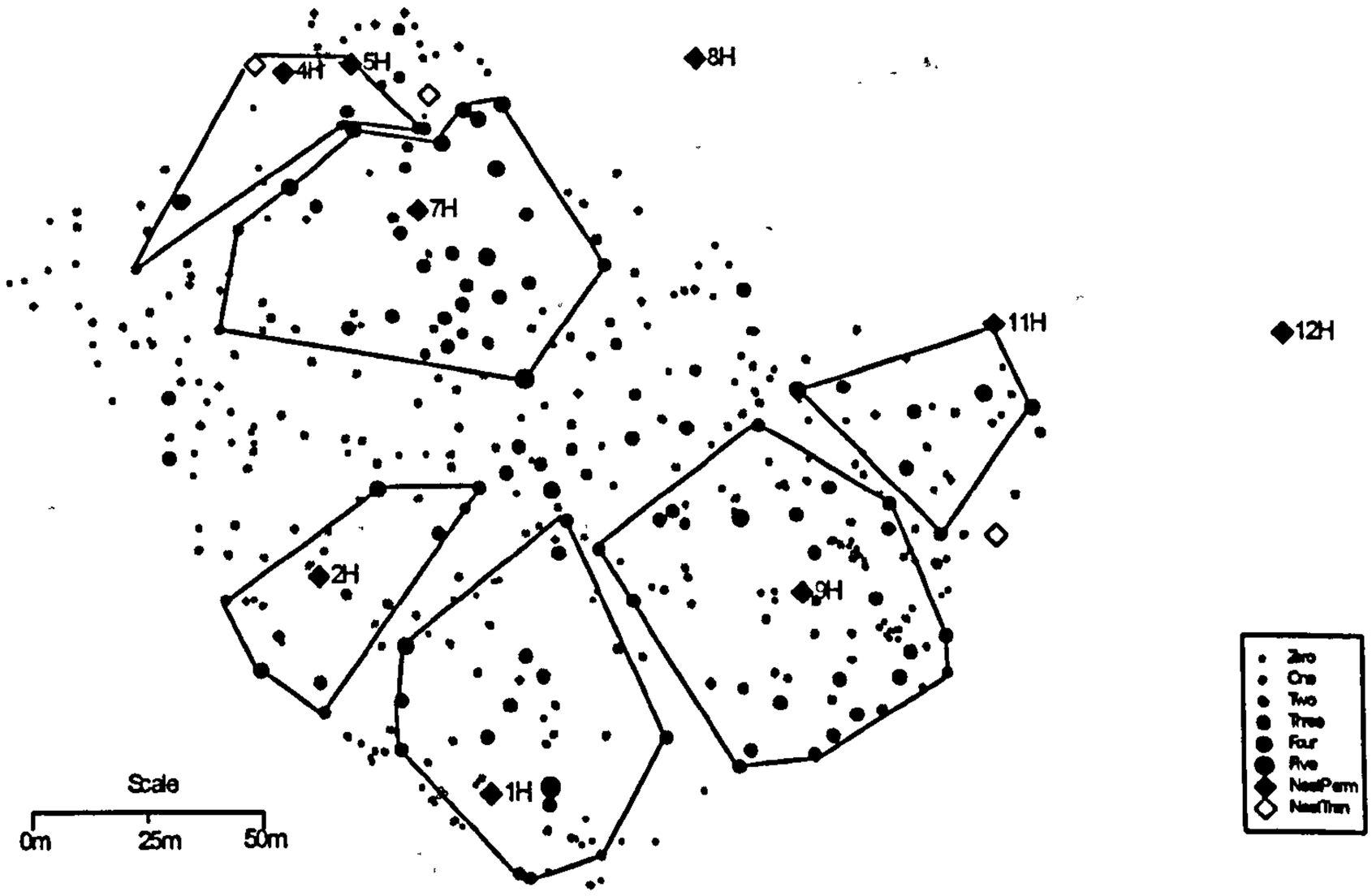
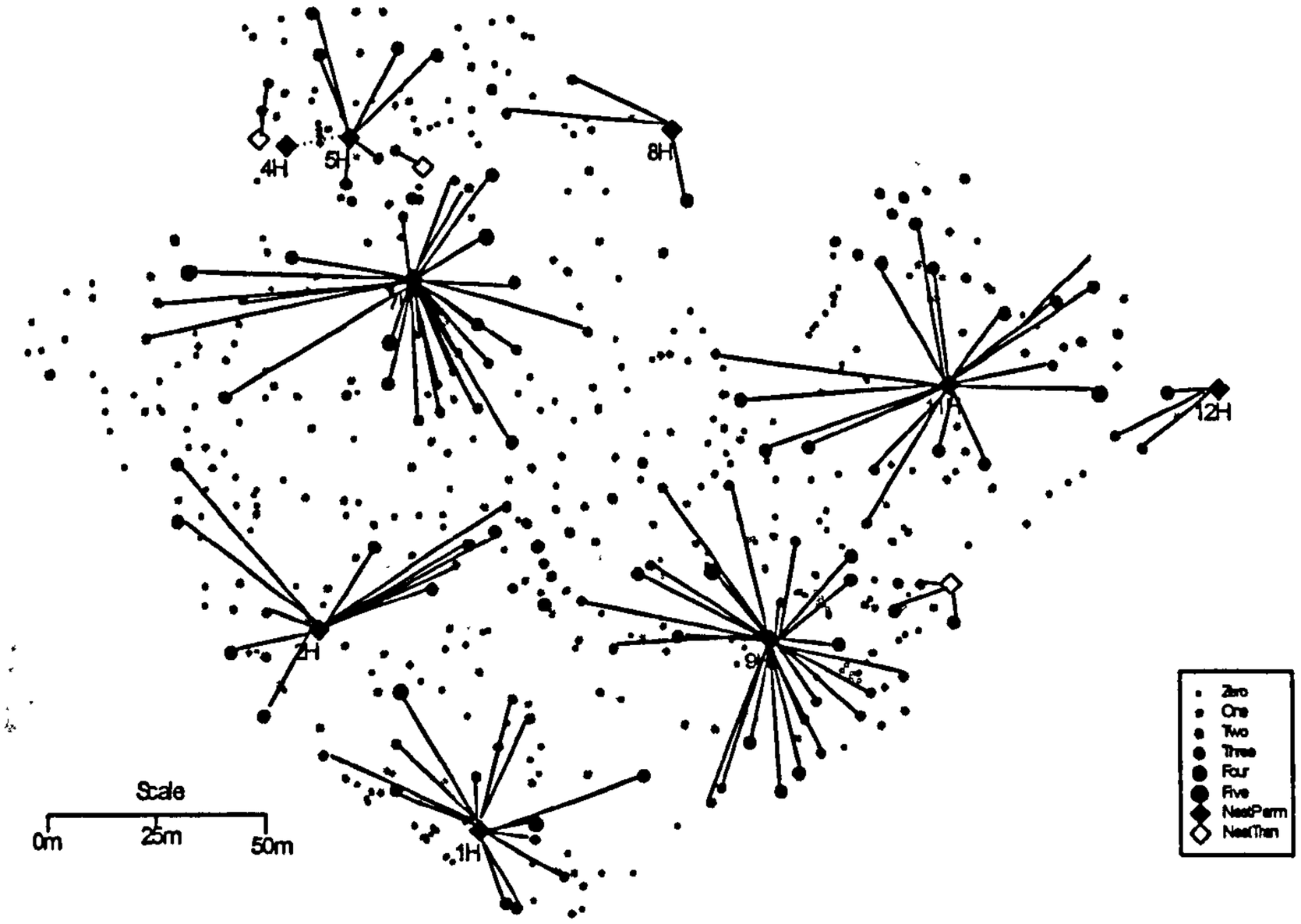


Figure 4.59: Map of foraging activity for Halse whole site count for 16/08/94 a) trails to nest b) approximate boundaries

a)



b)

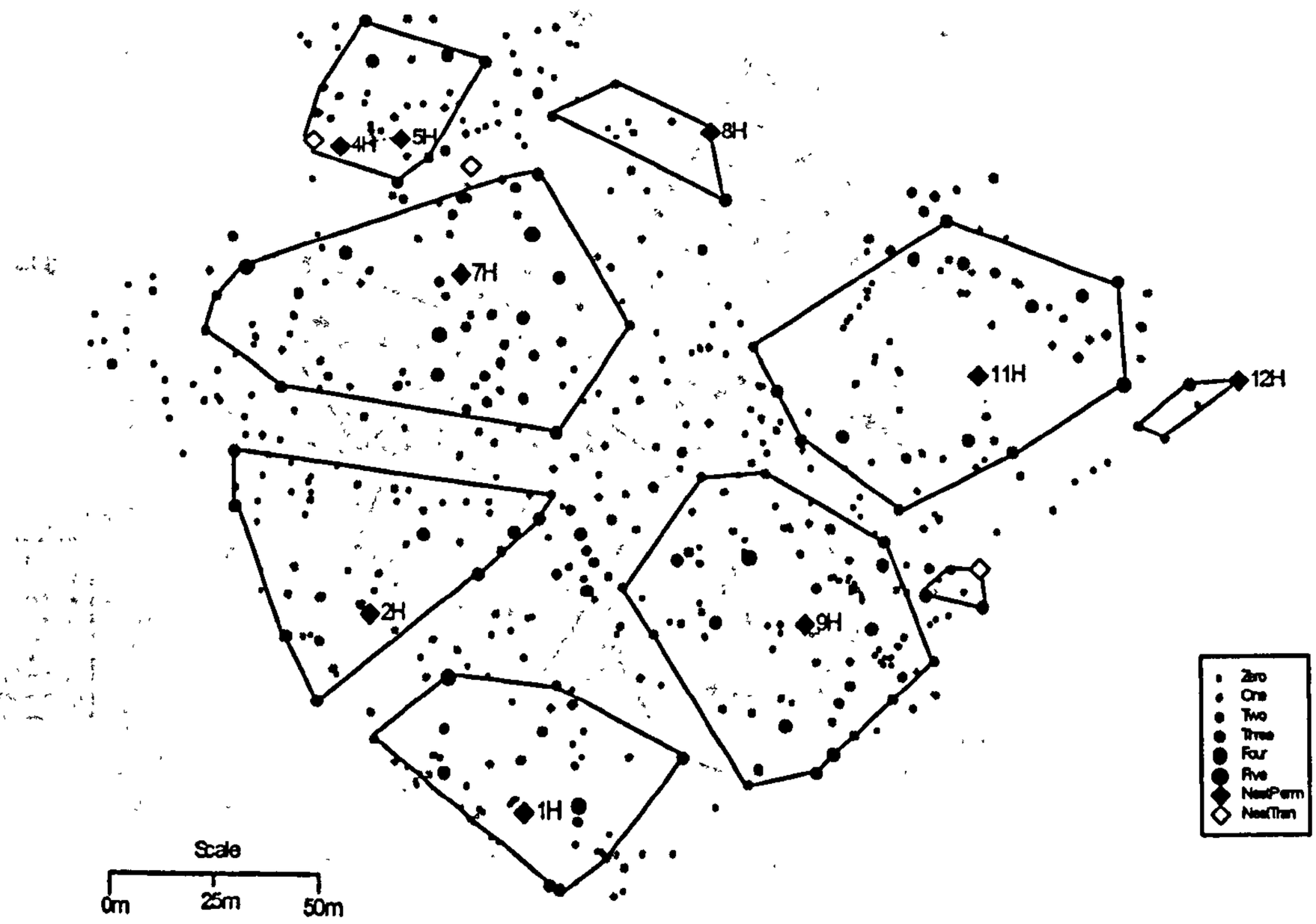
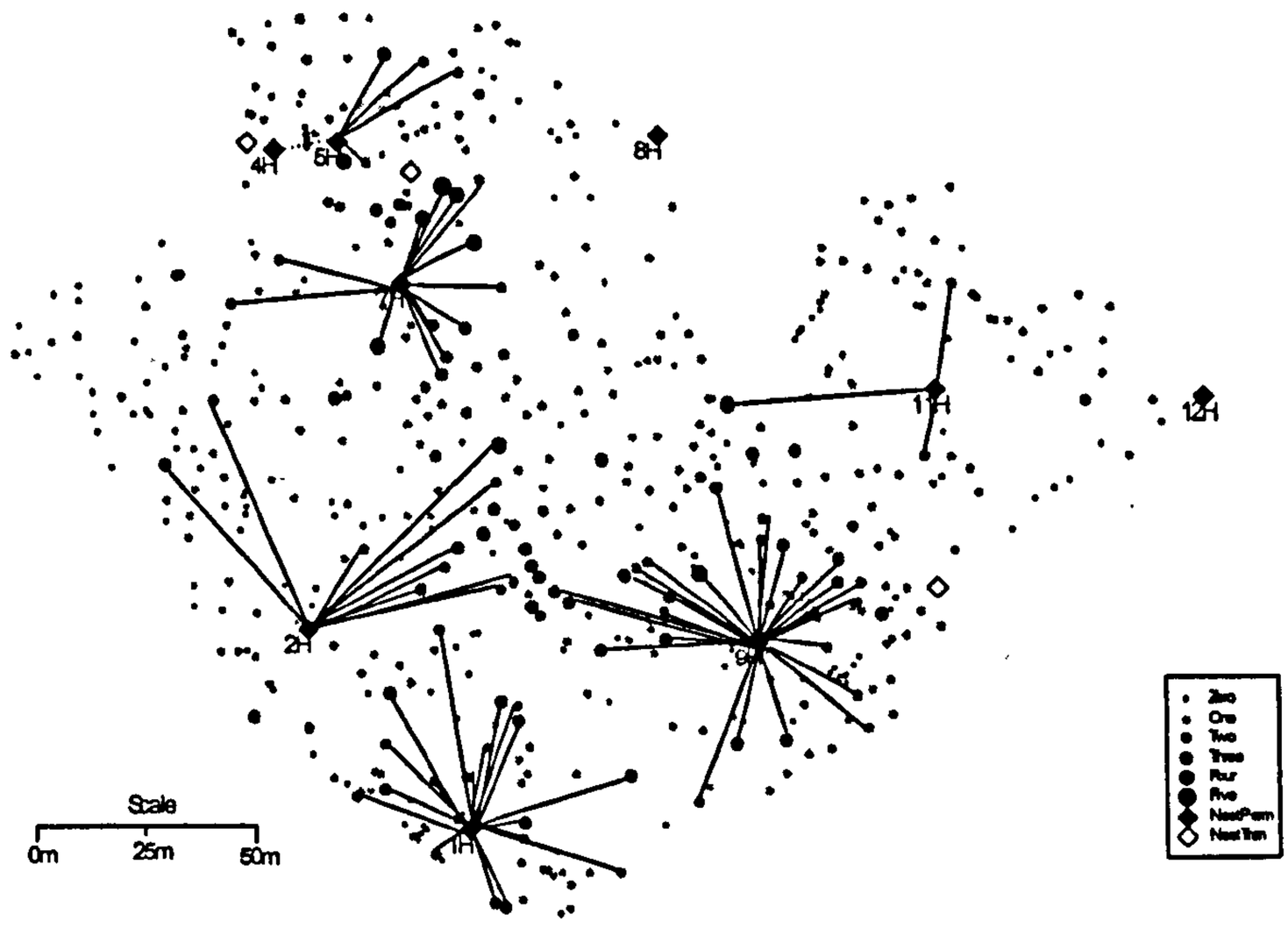


Figure 4.60: Map of foraging activity for Halse whole site count for 12/04/95 a) trails to nest b) approximate boundaries

a)



b)

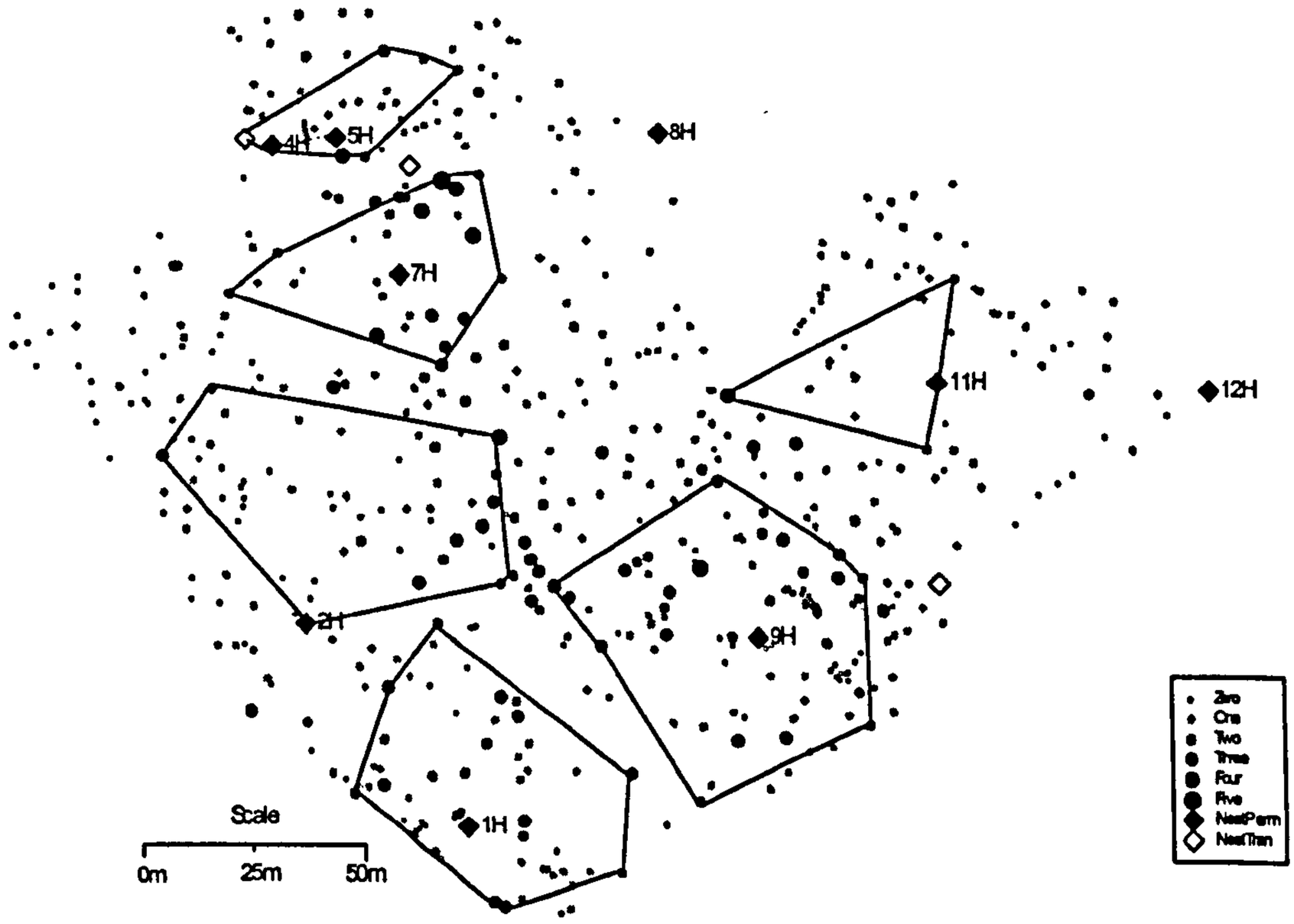
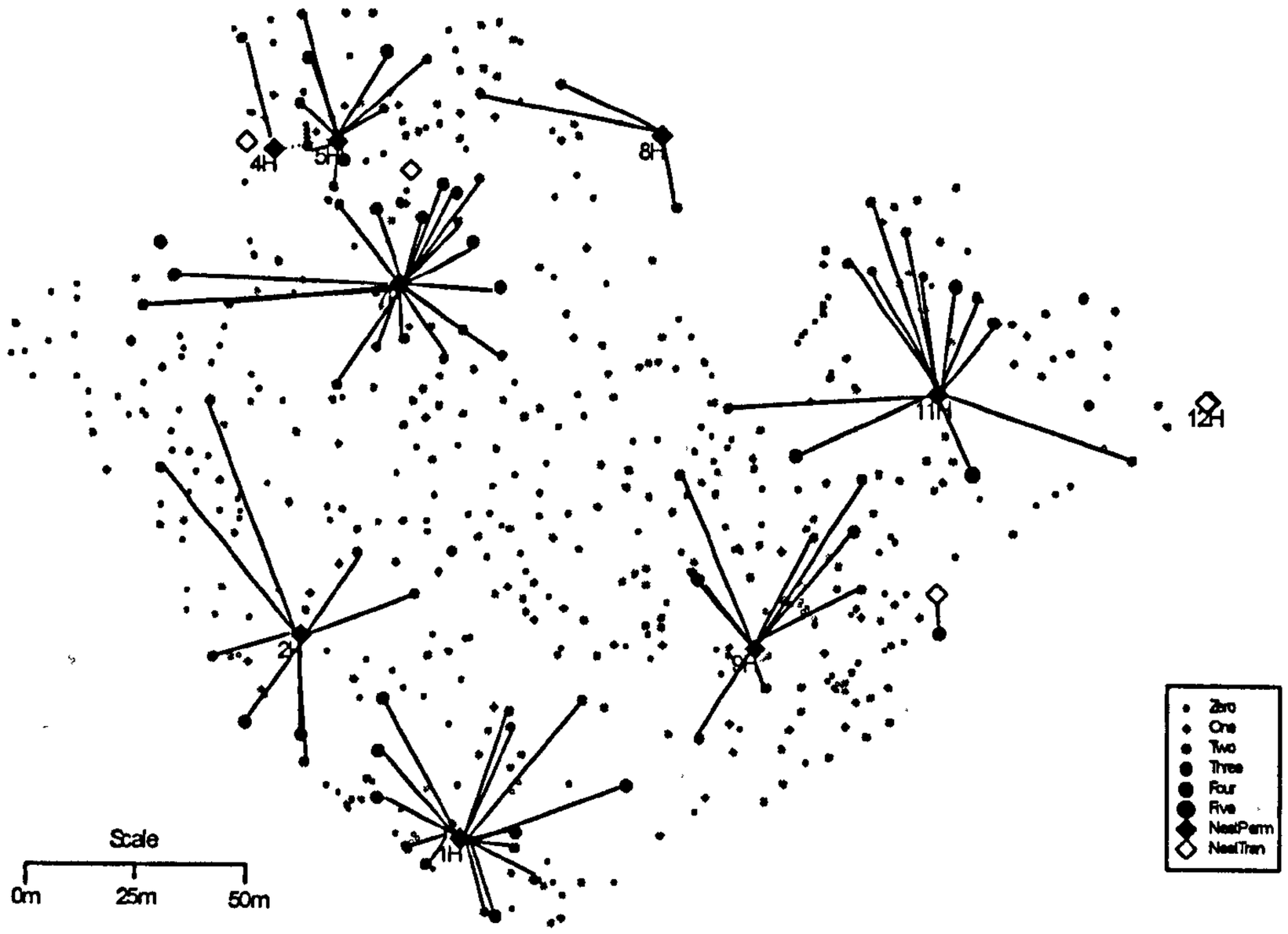


Figure 4.61: Map of foraging activity for Halse whole site count for 24/05/95 a) trails to nest b) approximate boundaries

a)



b)

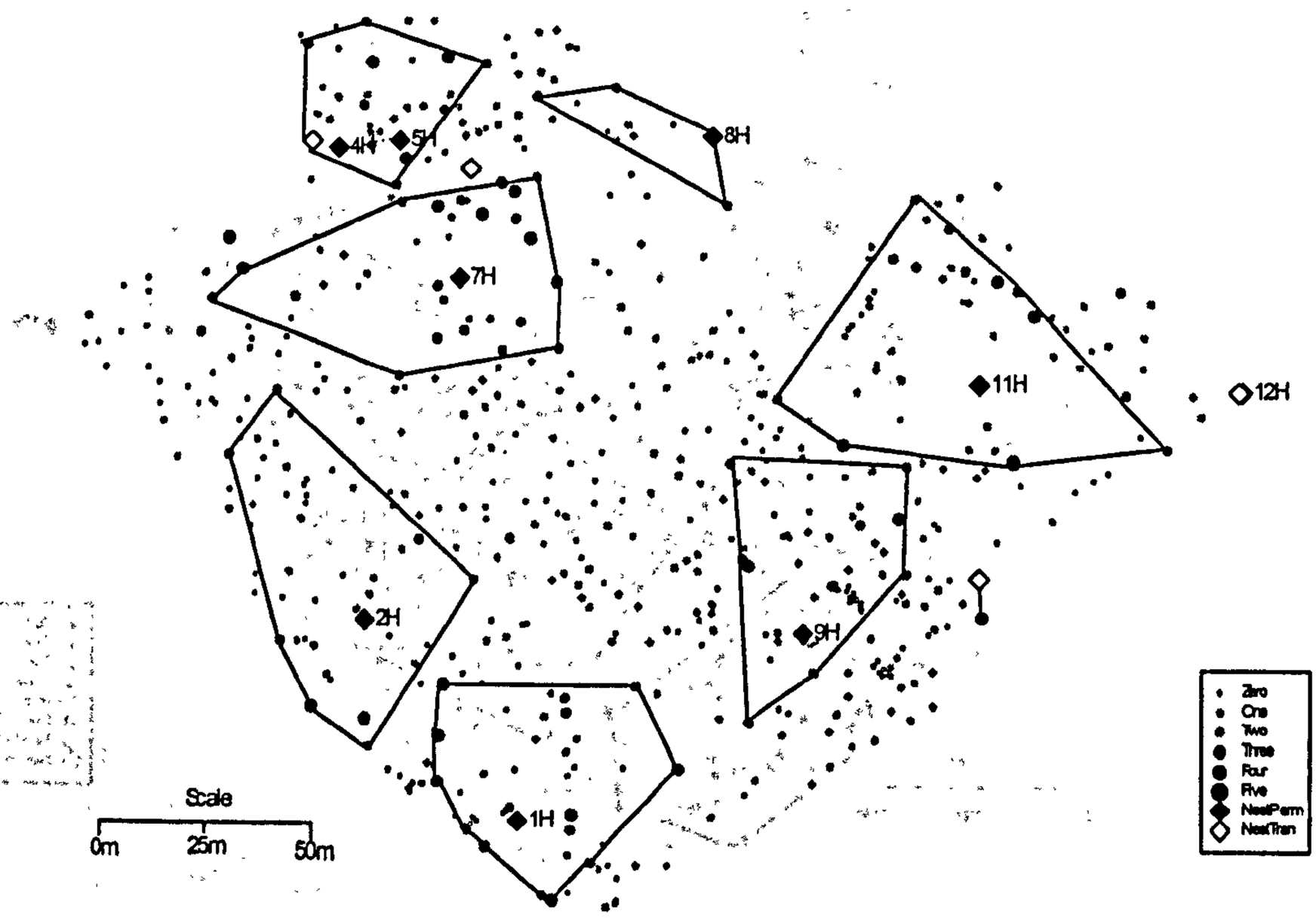
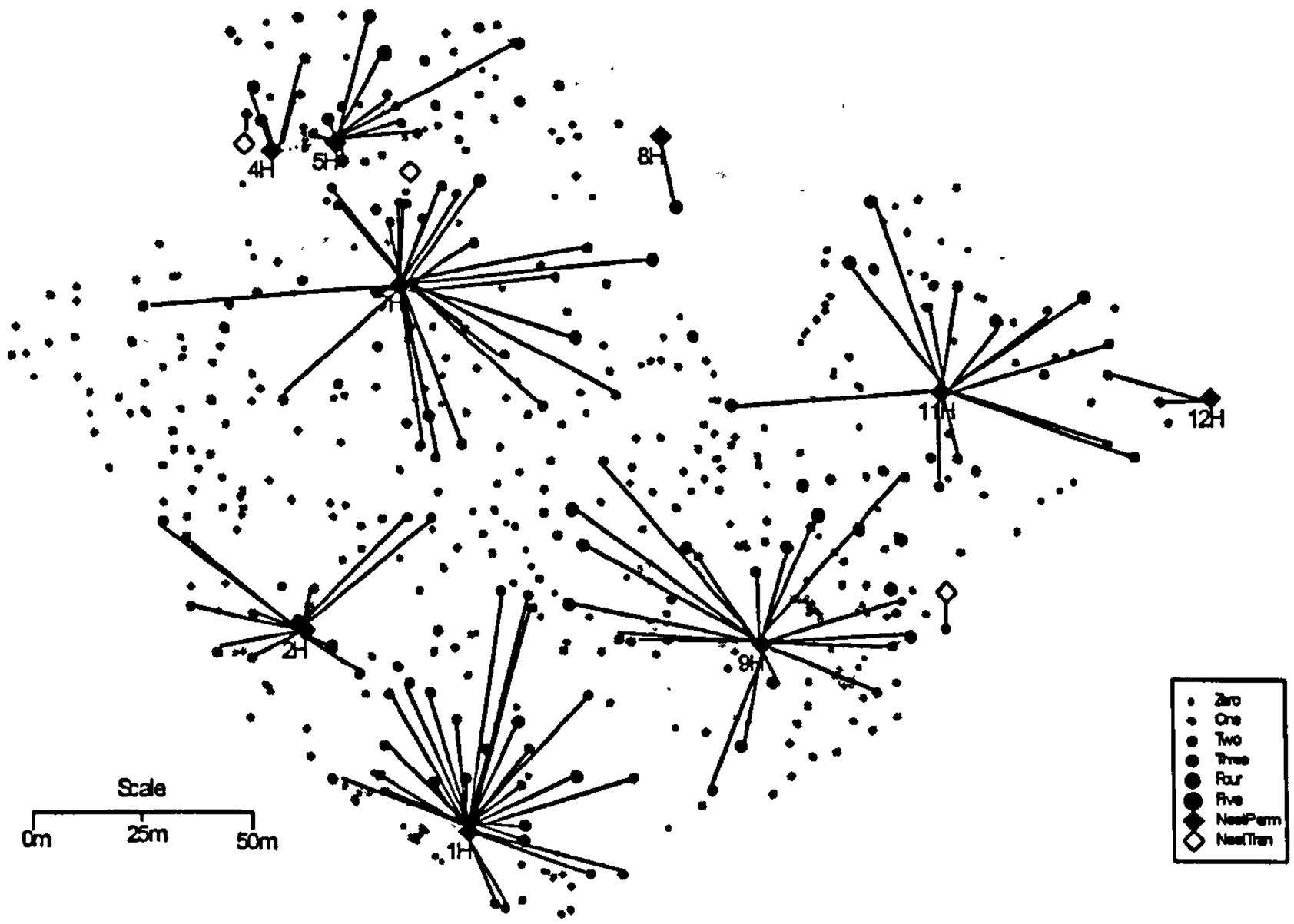


Figure 4.62: Map of foraging activity for Halse whole site count for 19/07/95 a) trails to nest b) approximate boundaries

a)



b)

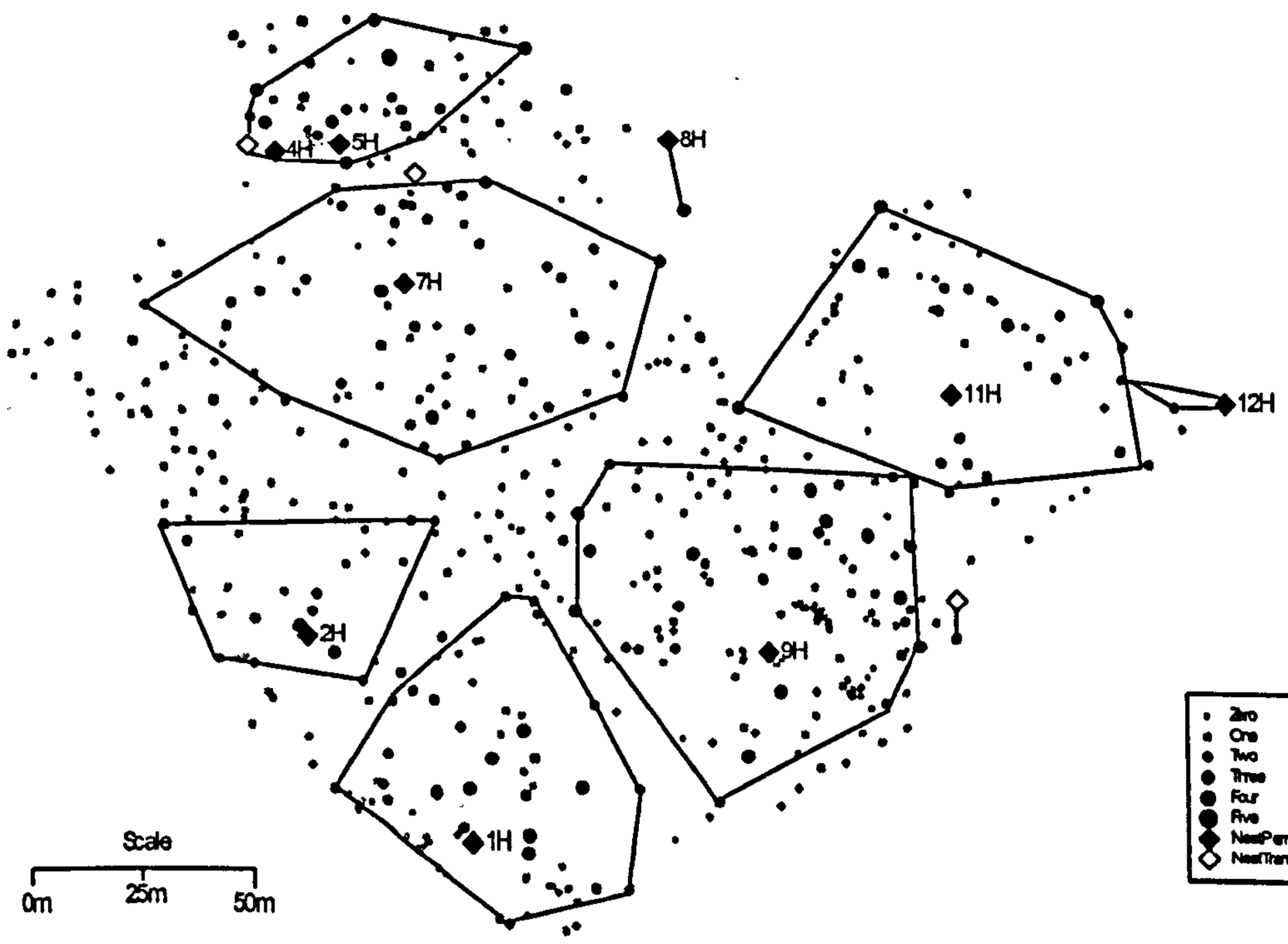
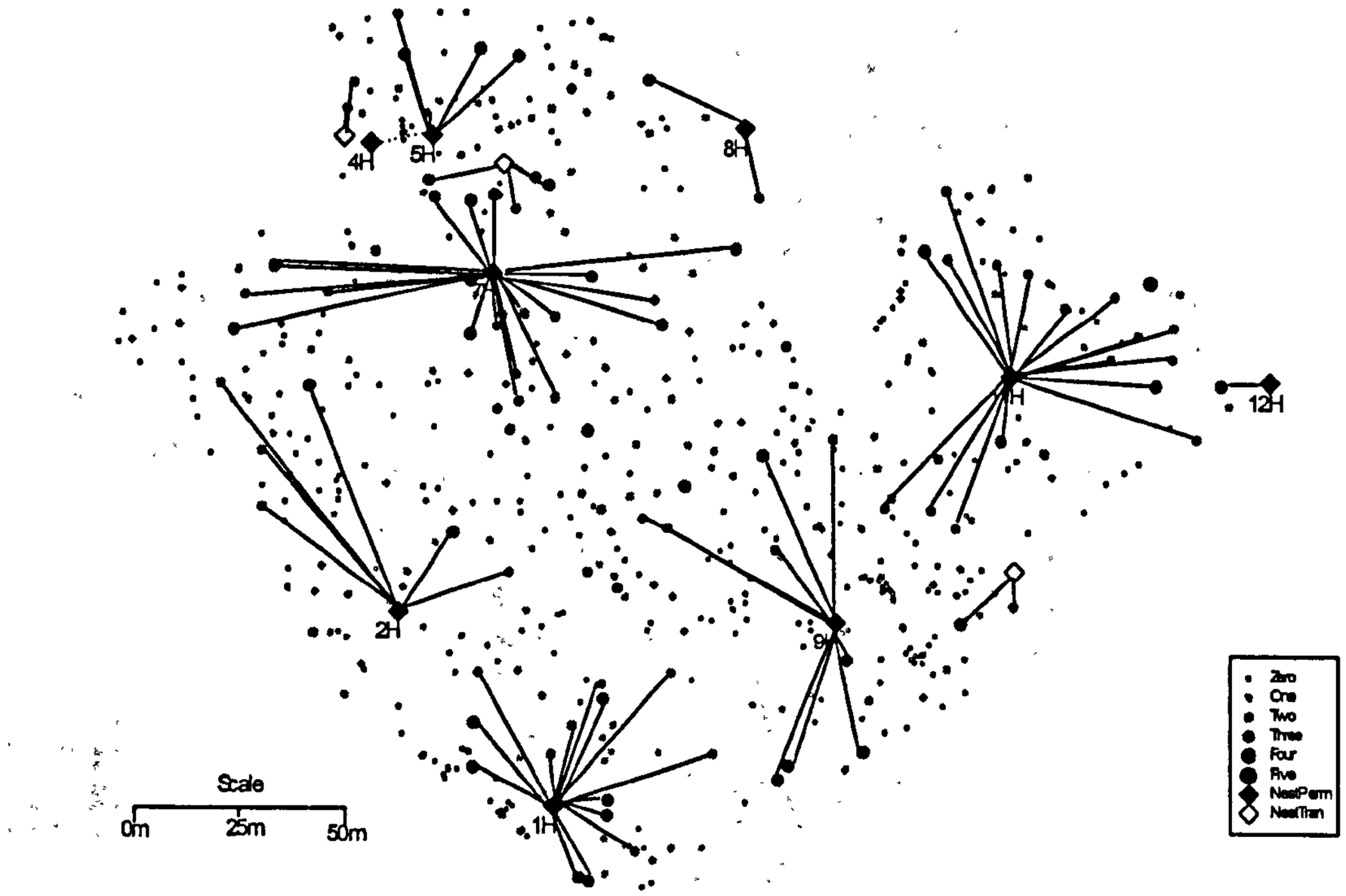


Figure 4.63: Map of foraging activity for Halse whole site count for 06/09/95 a) trails to nest b) approximate boundaries

a)



b)

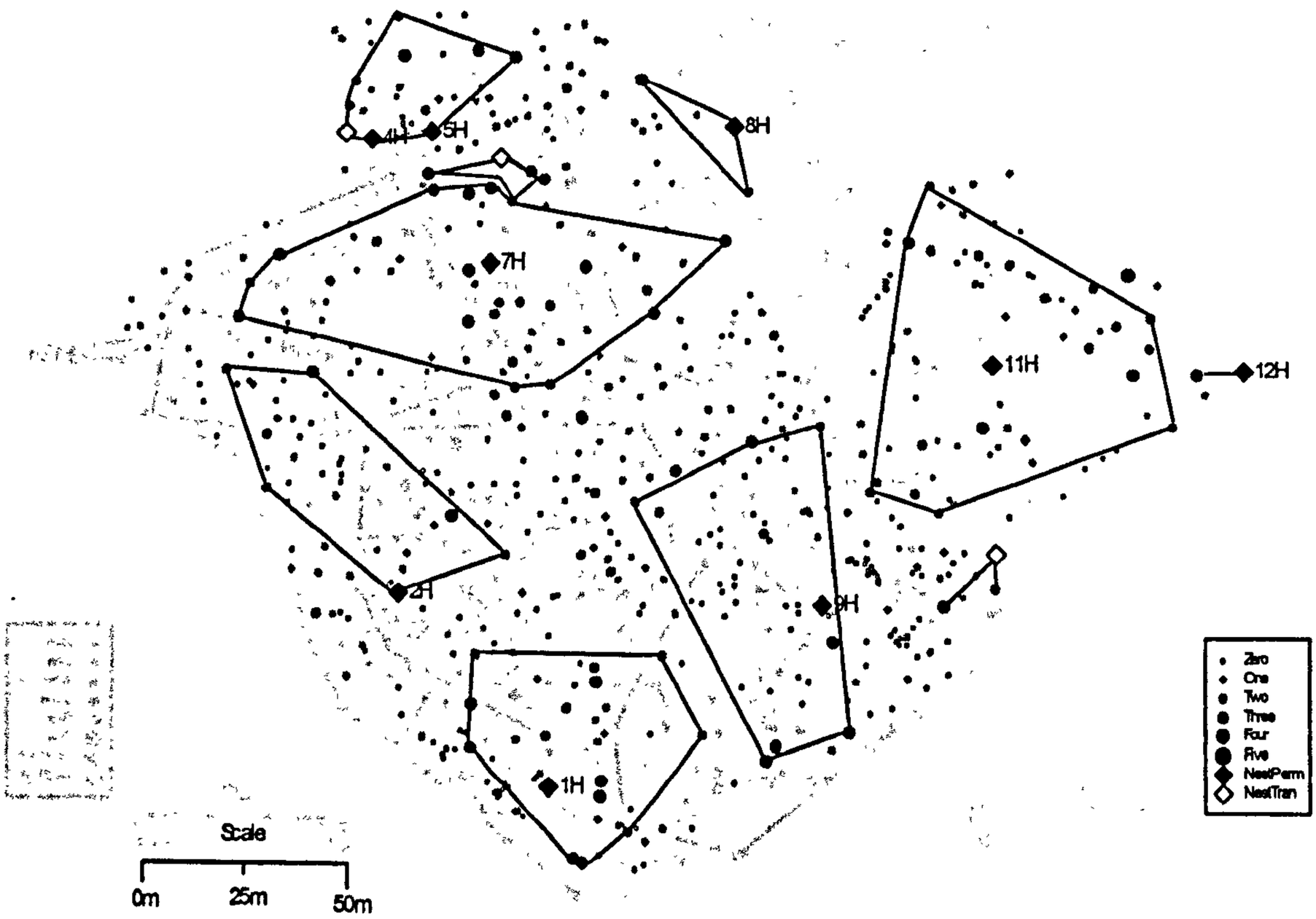
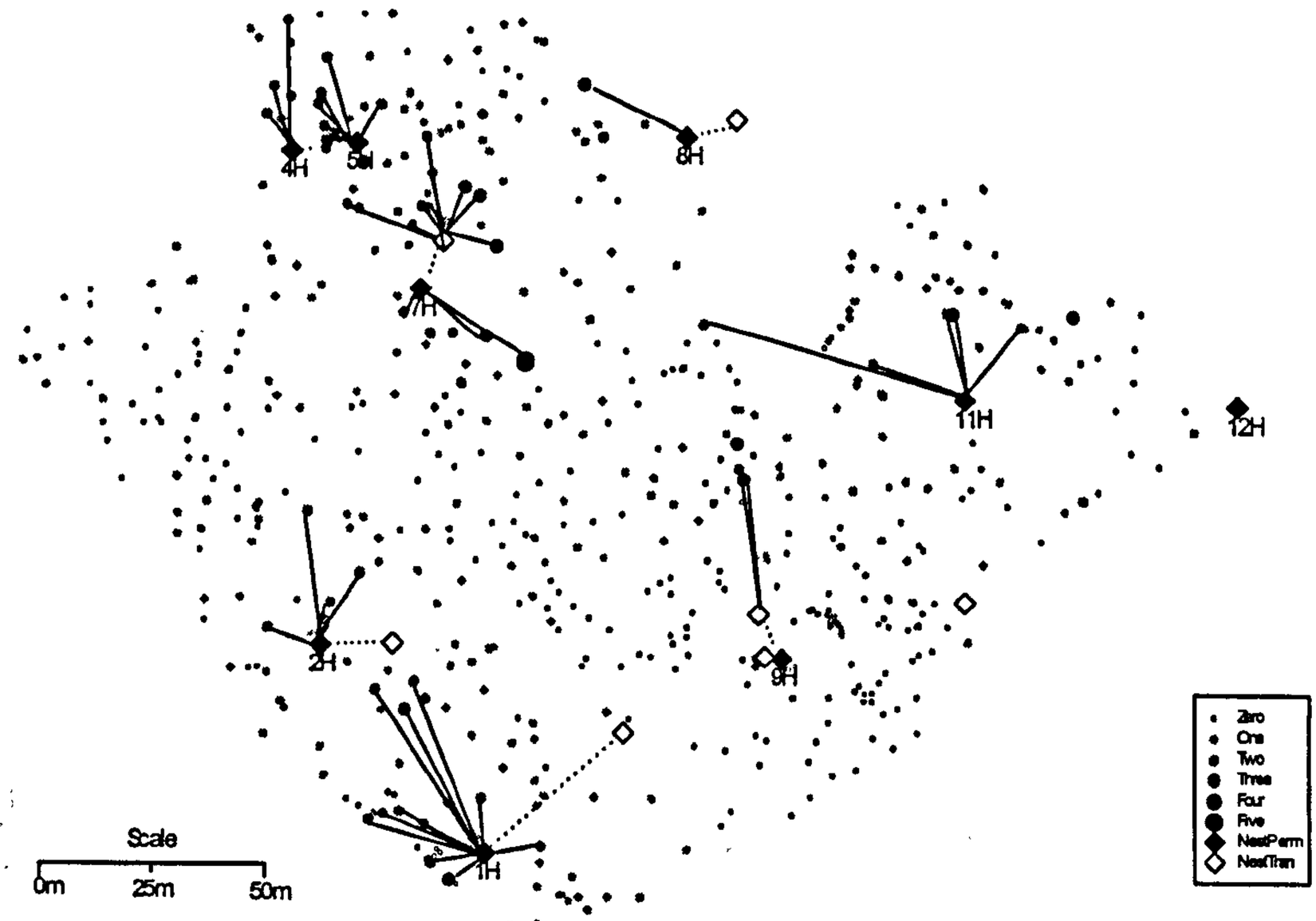


Figure 4.64: Map of foraging activity for Halse whole site count for 15/11/95, trails to nest

Figure 4.65: Map of foraging activity for Halse whole site count for 17/04/96 a) trails to nest b) approximate boundaries

a)



b)

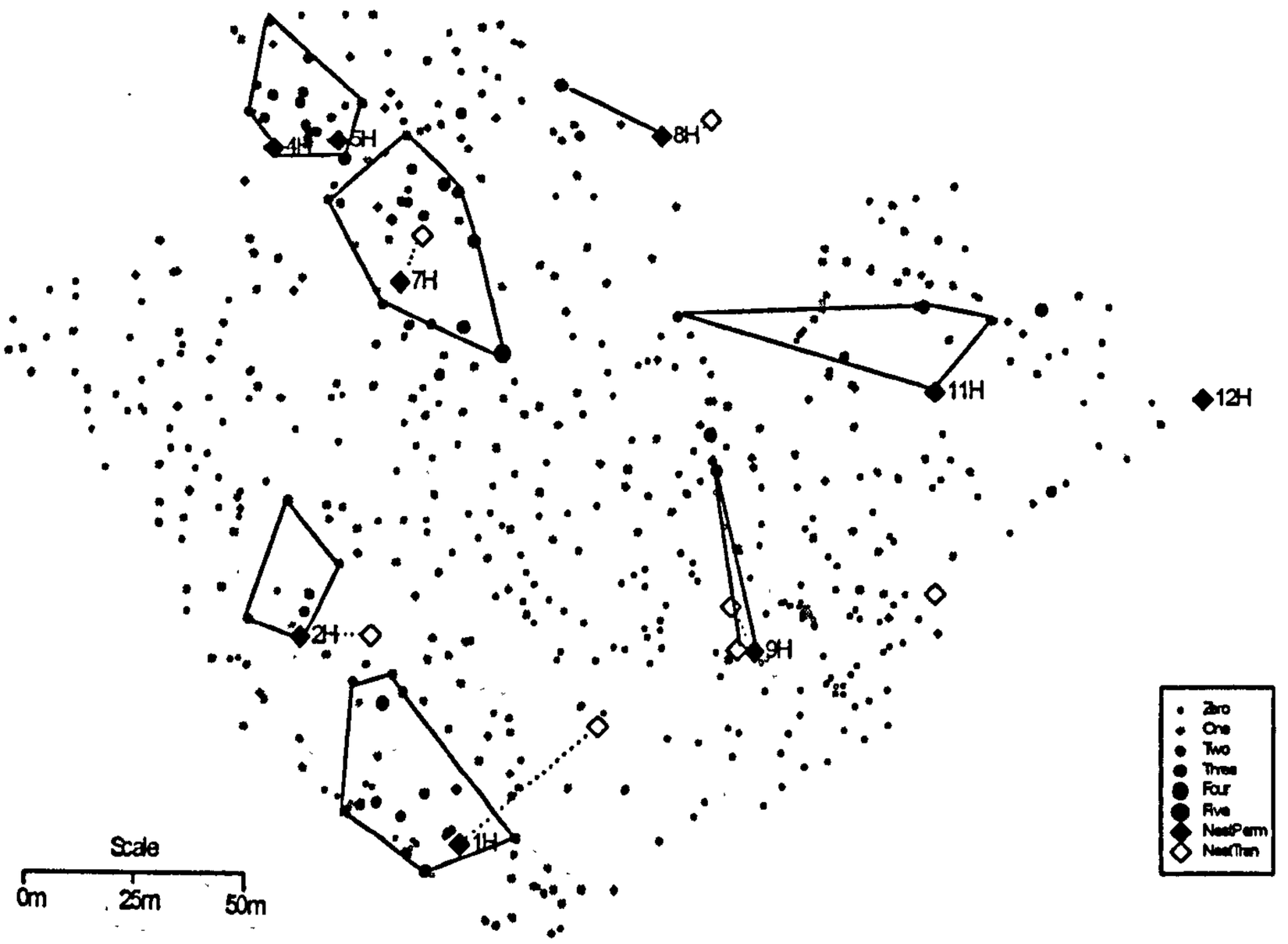
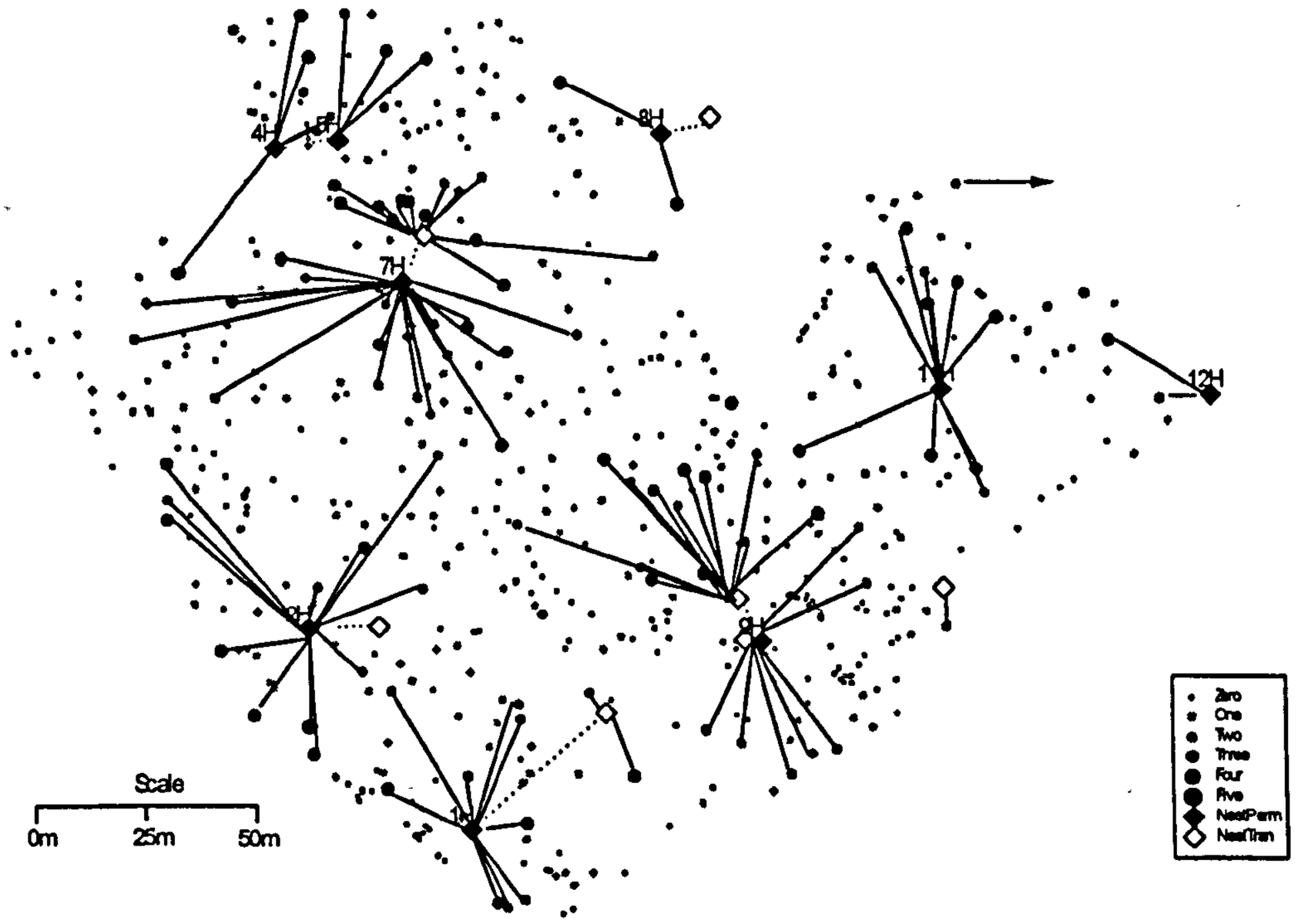


Figure 4.66: Map of foraging activity for Halse whole site count for 24/06/96 a) trails to nest b) approximate boundaries

a)



b)

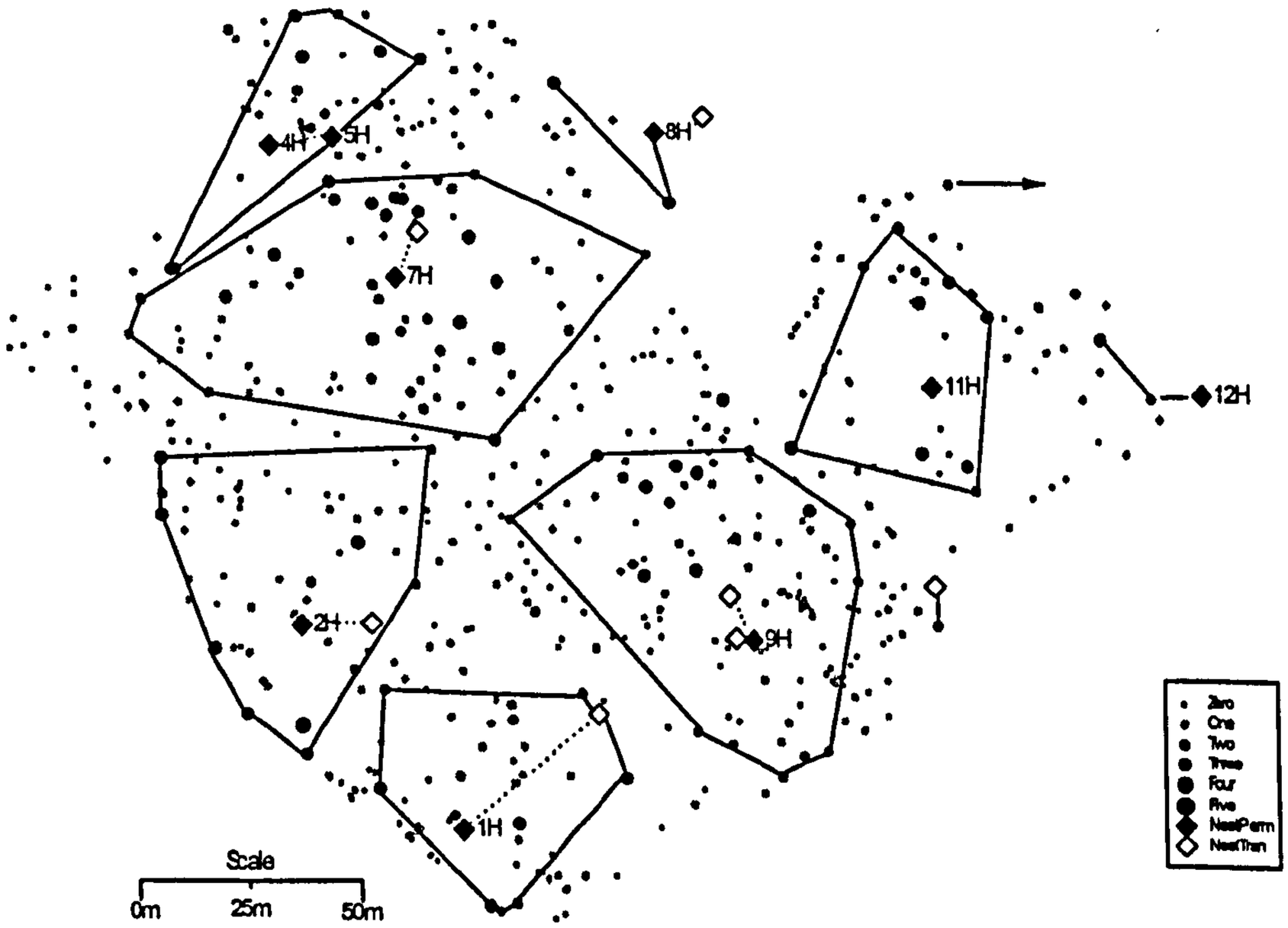


Table 4.31: Summary of the difference maps for foraging activity counts within a year for Halse 1994 to 1996. Maps in Appendix G.

Figure number	Difference map	Difference in the average temperature during the foraging count / °C	Comparison of the difference between the spatial distribution of foraging activity counts within a year for Halse 1994 to 1996
Figure G.1	07/94 with 16/08/94	-4	Very little change, a slight overall decrease in August.
Figure G.2	12/04/95 with 24/05/95	0	Decrease in May with the change mainly around 9H (the area grease-banded).
Figure G.3	24/05/95 with 19/07/95	-8	General increase in foraging activity from May to July due to the increase in foraging activity on beech.
Figure G.4	19/07/95 with 06/09/95	+6	General decrease in activity over the site from July to September.
Figure G.5	06/09/95 with 15/11/95	+7	Activity over whole site decreases to 0.
Figure G.6	17/04/96 with 24/06/96	-4	April 1996 was a cold month (Figures 3.8 and 3.9) and foraging activity was generally low. There was a large overall increase in foraging activity between April and June.

Table 4.32: Summary of the difference maps for foraging activity counts between years for Halse 1994 to 1996. Maps in Appendix G.

Figure number	Difference map	Difference in the average temperature during the foraging count / °C	Comparison of the difference between the spatial distribution of foraging activity counts between years for Halse 1994 to 1996
Figure G.7	07/94 with 19/07/95	-5	A reduction in foraging activity in 1995 as compared to 1994 can be seen around 9H due to the presence of grease-bands
Figure G.8	16/08/94 with 19/07/95	-2	In July 1995 there was an increase in foraging activity on beech as compared with August 1994
Figure G.9	12/04/95 with 17/04/96	+2	April 1995 was generally a much colder month than in 1996 (Figures 3.8 and 3.9) which is reflected in the overall decrease in foraging activity in 1996 as compared with 1995, particularly on oak. The abundance of *L. roboris* on oak was much lower in 1996 (Figure 5.6) which might also be another factor in the decrease in foraging activity on oak.
Figure G.10	24/05/95 with 24/06/96	0	There was an increase in foraging activity in June 1996 as compared with May 1995
Figure G.11	19/07/95 with 24/06/96	+6	In July 1995 there was an increase in foraging activity on beech as compared with June 1996
Figure G.12	07/94 with 24/06/96	+1	Most of the areas of significant decrease in foraging activity from July 1994 to June 1996 are around nest 9H. 1996 saw a switch away from the trees south of the nest, which were grease-banded, to greater foraging on trees to the north of the nest, beyond the grease-banded area.
Figure G.13	16/08/94 with 24/06/96	+4	Almost all the areas of significant decrease between August 1994 and June 1996 are around nest 9H where the trees were grease-banded. The move of foraging activity to the north of the nest can be seen.

The maps show seasonal change in foraging areas very clearly. The foraging areas vary in shape through time but the gaps between unconnected nests are maintained, for example between 1H and 9H. Foraging activity increases rapidly in the spring 1995 and quickly builds to a maximum in the summer 1995. Foraging areas decrease in September 1995 and are almost zero in November 1995. Spring 1996 was very cold and foraging areas were very small. In May 1995, the foraging area of nest 9H is all north of the nest due to the grease-bands.

The foraging area of each nest where the foraging area was wholly contained within Halse was calculated as described in section 4.3.4.1.2. The results are shown in Figure 4.67.

Figure 4.67: Changes in foraging areas for nests wholly contained within Halse

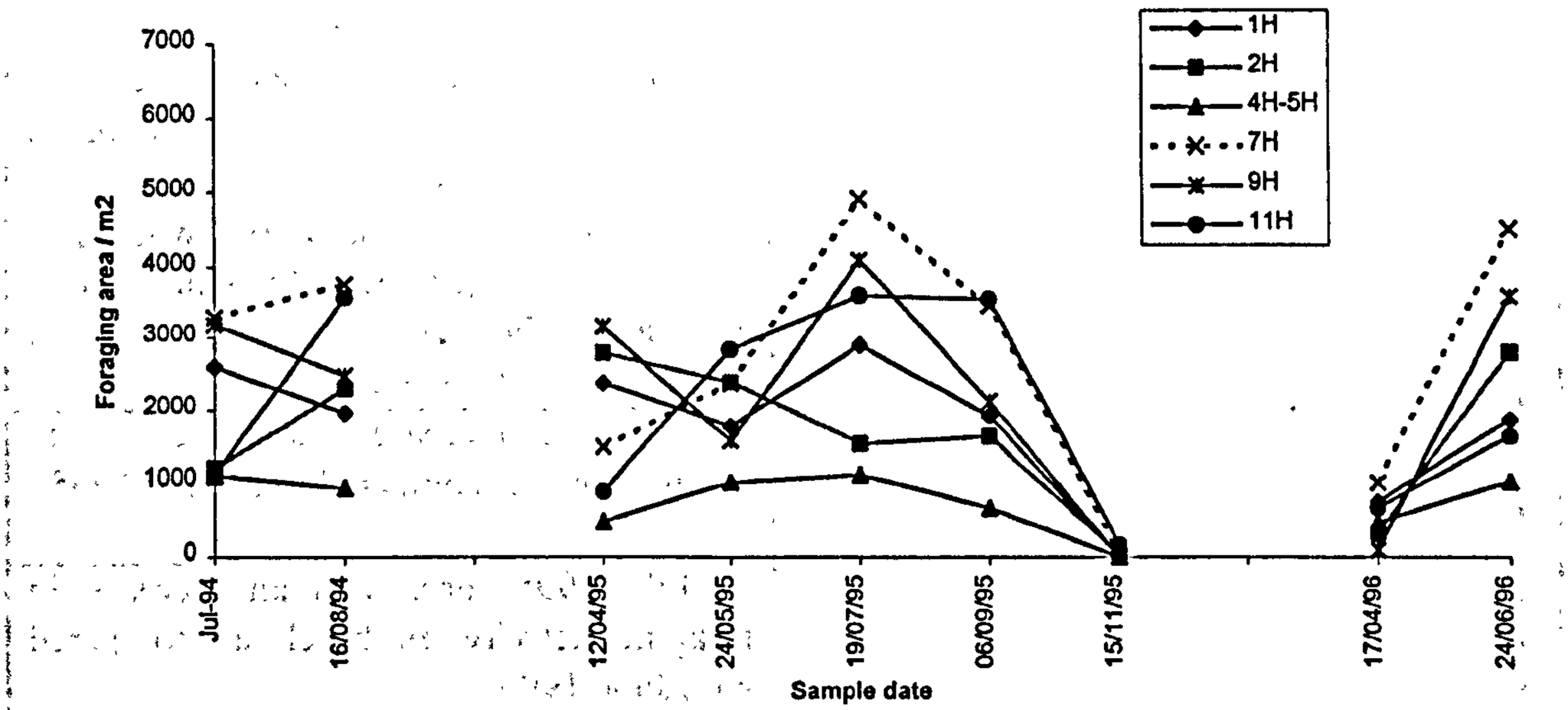


Table 4.33 shows the relative changes of foraging area (relative to each nest's foraging area in August 1994). The general pattern is an increase in area from the April value to the July value and then a decrease down to almost no foraging area in November. The May 1995 figure shows a drop in three out of six cases. A similar drop was observed for Dimsdale (Table 4.22).

Despite the general pattern, there is considerable individual variation. This makes it difficult to assess whether the grease-banding of the trees around 9H in 1995 and 1996 had any effect upon its territory. It can be seen that on three dates (April, and July 1995 and June 1996) 9H has the largest relative value of all the nests. It could be argued that restricting the food supply near the nest has forced foraging to occur further from the nest, thus expanding the foraging area beyond what might otherwise have occurred.

Table 4.33: Relative change in foraging areas for nests wholly contained within Halse

	1H	2H	4H-5H	7H	9H	11H
16/08/94	1	1	1	1	1	1
12/04/95	1.21	1.21	0.51	0.39	1.27	0.25
24/05/95	0.90	1.03	1.07	0.63	0.63	0.79
19/07/95	1.48	0.66	1.18	1.30	1.65	1
06/09/95	0.98	0.71	0.40	0.91	0.85	0.99
15/11/95	0	0.02	0	0	0	0.04
17/04/96	0.38	0.14	0.49	0.26	0.04	0.19
24/06/96	0.95	1.22	1.08	1.20	1.44	0.46

Table 4.34 shows the number of beech, oak and silver birch trees contained within each foraging area of the permanent nests wholly contained within Halse. It can be see that the average relative proportions of trees varies considerably from nest to nest, e.g. 2H generally has considerably more beech than oak, whilst 4-5H has a more balanced distribution of oak and beech, and slightly more silver birch than both of these.

Most of the nests show their largest numbers of beech in July 1995. From section 4.3.3.1, it has been seen that at this time there was a sharp drop in the heavy foraging of oak, and a corresponding increase in heavy foraging on beech. The results here indicate that this was not just a switch to beech trees within the existing foraging area, but a reorientation of the foraging area to include more beech trees.

Table 4.34: Number of beech, oak and silver birch trees in the foraging area of nests wholly contained within Halse

Date	1H			2H			4-5H		
	Beech	Oak	Silver birch	Beech	Oak	Silver birch	Beech	Oak	Silver birch
07/94	21	18	14	20	8	0	2	5	3
16/08/94	24	14	12	44	12	1	9	7	11
12/04/95	28	15	15	44	17	1	6	3	7
24/05/95	18	14	11	39	9	0	8	8	11
19/07/95	29	19	16	30	3	1	15	6	14
06/09/95	17	16	10	29	9	0	7	5	10
15/11/95	0	1	0	4	1	0	0	1	0
17/04/96	11	4	12	8	0	0	7	2	11
24/06/96	17	15	10	48	10	1	7	8	10

Date	7H			9H			11H		
	Beech	Oak	Silver birch	Beech	Oak	Silver birch	Beech	Oak	Silver birch
07/94	18	34	0	15	42	34	15	9	0
16/08/94	25	39	0	16	40	34	18	25	15
12/04/95	8	22	0	16	38	34	3	3	7
24/05/95	13	28	0	8	16	29	13	17	15
19/07/95	31	43	4	32	50	36	17	25	14
06/09/95	25	35	1	10	26	16	19	29	9
15/11/95	0	0	0	0	0	0	1	2	0
17/04/96	4	17	3	1	1	9	2	1	9
24/06/96	30	43	2	15	49	35	11	10	9

Table 4.35 shows the percentage of available trees within each foraging area foraged at category 1 or above for the same nests as above. The predominance of foraging on oak over beech is again seen, with very high percentages of oak foraged. The maximum foraging effort on beech tends to occur in July 1995 (the figures for November 1995 and April 1996 can be a little misleading, because there may only be one tree in the foraging area and therefore the percentage value will be 0 or 100 %).

Table 4.35: Percentage of available beech, oak and silver birch trees foraged at count 1 or above within nest foraging areas wholly contained within Halse

Date	1H			2H			4-5H		
	Beech	Oak	Silver birch	Beech	Oak	Silver birch	Beech	Oak	Silver birch
07/94	81	72	14	80	100	na	0	80	0
16/08/94	50	100	17	50	83	0	0	71	0
12/04/95	79	87	27	32	88	0	0	33	14
24/05/95	39	93	27	44	89	na	0	25	9
19/07/95	86	89	75	100	100	100	33	17	7
06/09/95	71	75	20	24	100	na	0	60	0
15/11/95	na	100	na	75	100	na	na	0	na
17/04/96	64	100	50	86	na	na	0	0	9
24/06/96	59	87	30	50	100	100	0	75	0

Date	7H			9H			11H		
	Beech	Oak	Silver birch	Beech	Oak	Silver birch	Beech	Oak	Silver birch
07/94	61	91	na	53	86	26	60	89	na
16/08/94	44	95	na	44	83	9	56	92	20
12/04/95	63	95	na	50	92	32	100	100	43
24/05/95	38	93	na	50	100	28	69	82	47
19/07/95	87	98	50	91	82	75	82	96	50
06/09/95	44	91	100	40	23	13	32	79	33
15/11/95	na	na	na	na	na	na	100	100	na
17/04/96	100	100	100	0	0	78	100	100	78
24/06/96	63	95	0	20	71	9	45	90	44

Table 4.36 shows the mean distance to actively foraged beech trees (abundance category 1 or above and abundance category 3 or above) within a nest foraging area for each sample date. Blanks cells in the table indicate that there were no trees of that species recorded as foraged at that abundance category or above on that date. Table 4.37 shows the data for actively foraged oak trees.

The mean distance to foraged beech varies between 17.5 m and 27.0 m for abundance category 1 and above and 4.9 m and 45.8 m for abundance category 3 and above. The mean distance for abundance category 1 and above varies between 24.1 m and 33.8 m, 24.6 m and 33.1 m for abundance category 3 and above. Overall, the average distance travelled to a beech tree was 21 m and 28 m to an oak tree for abundance category 1 or above. For abundance category 3 or above, the average distance travelled to a beech tree was 17 m and 29 m to an oak tree.

Table 4.36: Mean distance (m) to foraged beech trees contained within nest foraging areas at Halse

Date	Abundance category 1 or above						Abundance category 3 or above					
	1H	2H	4H	7H	9H	11H	1H	2H	4H	7H	9H	11H
15/07/94	22.7	15.4		29.9	14.3	31.7	14.4				12.4	45.8
16/08/94	22.5	20.7	15.1	30.1	16.7	20.4						
12/04/95	23.3	37.3	22.6	19.0	16.4	16.2						
24/05/95	18.0	22.7	17.3	21.2	18.6	25.2						
19/07/95	25.3	20.4	30.7	35.4	28.1	23.3	16.8	4.9	26.9	5.5	35.6	
06/09/95	17.9	25.0	12.9	31.3	29.0	22.6	12.4			5.5	9.1	
15/11/95		6.0										
17/04/96	28.0	11.6	13.9	18.9	0	15.6						
24/06/96	20.1	21.0	10.1	30.5	17.5	19.2						
Mean	22.2	20.0	17.5	27.0	20.1	21.8	14.6	4.9	26.9	5.5	19.1	45.8

Table 4.37: Mean distance (m) to foraged oak trees contained within nest foraging areas at Halse

Date	Abundance category 1 or above						Abundance category 3 or above					
	1H	2H	4H	7H	9H	11H	1H	2H	4H	7H	9H	11H
15/07/94	27.7	27.2	30.0	24.8	27.5	30.5	26.6	27.1	29.7	22.7	29.0	29.0
16/08/94	24.5	37.6	28.0	27.0	27.1	30.6	23.2	34.9	28.3	30.6	25.8	29.0
12/04/95	23.5	44.7	33.2	19.2	26.9	28.6	23.9	45.5	33.4	18.7	29.8	47.1
24/05/95	25.0	31.1	25.9	23.9	28.3	31.5	24.8	22.7	27.6	24.9	27.2	24.5
19/07/95	29.7	27.6	27.1	26.3	29.3	31.5	19.9		33.4	44.5	28.1	37.2
06/09/95	24.9	47.2	27.9	27.2	34.8	31.8	20.2	39.2	31.7	34.0	34.8	28.0
15/11/95	35.6	22.4	21.8			21.6						
17/04/96	24.0		17.9	17.9		20.2	35.6			22.6		
24/06/96	25.0	32.3	30.7	26.8	34.5	26.3	22.5	29.4	32.8	22.8	35.9	24.9
Mean	26.6	33.8	26.9	24.1	29.8	28.1	24.6	33.1	21.0	27.6	30.1	31.4

To determine whether there was a significant difference between the mean distance travelled to beech trees as compared to oak trees during the study period a Mann-Whitney *U* test was performed for abundance category 1 or above (Table 4.38) and abundance category 3 or above (Table 4.38). A nonparametric measure was used as no assumption about the shape of the distribution had to be made (Siegel 1956).

Table 4.38: Mann-Whitney *U* test for differences between the mean distance travelled to beech and oak trees in Halse throughout the study period 1994 to 1996

*** Significant at 0.001, ns = not significant.

Mean distance travelled to beech and oak trees	*U*	z	Significance
Abundance category 1 or above	94.5	-3.1	**
Abundance category 3 or above	534.0	-4.6	***

The results show that there is a significant difference in the distance travelled to beech trees as compared to oak trees for both abundance category 1 or above and abundance category 3 or above. For all foraging on oak trees, workers travel further than for beech trees. Table 4.36 and Table 4.37 show that there are fewer heavily foraged beech trees than oak trees.

4.3.5 Sexual production

Digging up several nests showed that *F. rufa* are polygynous, with more than 100 queens in one large nest. In Burnham Beeches alatae began emerging in late May and continued for about 3 weeks in 1994, 1995 and 1996.

During 1995, only visual records were kept on the emergence of sexuals. Table 4.39 and Table 4.40 show the numbers of alatae seen on nest surfaces. Of the nests the 13 nests surveyed at Halse, 5 produced alatae (38 %). At Dimsdale 16 nests were surveyed and 7 produced alatae (44 %).

Table 4.39: Numbers of alatae seen on the surface of nests at Halse in 1995

m = alate males, f = alate queens

	1H	2H	3H	4H	5H	6H	7H	8H	9H	10aH	11H	12H
10/05/95	0	0	0	0	0	2m	5m	0	20m	5m	0	0
31/05/95	0	0	0	0	0	0	1f	0	0	1f	1f	0

Table 4.40: Numbers of alatae seen on the surface of nests at Dimsdale in 1995

m = alate males, f = alate queens

	1D	2D	3D	4D	5D	6D	9D	10D
10/05/95	0	20m	50m	0	10m	30m	0	0
31/05/95	0	0	0	0	0	0	0	3m
	11D	12D	13D	14D	15D	16D	17D	18D
10/05/95	0	2m	0	100m	0	0	0	0
31/05/95	0	0	0	0	0	0	0	0

During 1996, visual (Table 4.41) and sticky trap (Table 4.42) records of the number of alatae were made. The first nest on which alatae were seen was 10D (the fed nest), where male alatae were seen on the 15th May 1996. The nests and traps were checked daily but no more alatae were seen until five days later. The first queens were seen on nest 12D on the 27th May. For nests 1D to 6D, comprising the control colony at Dimsdale, no alatae were caught or seen on the surface of the nests from 15th May to 4th June. Of the three nests surveyed at Halse, 1 produced alatae (33 %). At Dimsdale ten nests were surveyed and three produced alatae (30 %).

Table 4.41: Numbers of alatae seen on the surface of nests in 1996 at Dimsdale and Halse

m = alate males, f = alate queens

	Dimsdale					Halse		
	10D	11D	12D	13D	14D	1H	7H	9H
20/05/96	m	0	m	0	0	m	0	0
21/05/96	0	0	m	0	0	0	0	0
25/05/96	0	0	m	0	0	0	0	0
26/05/96	m	0	m	0	0	0	0	0
27/05/96	100+ m	0	m, 1 f	0	0	50+ m	0	0
28/05/96	500+ m, f	0	50+ m, f	0	0	50+ m	0	0
30/05/96	m	0	10 f	0	0	0	0	0
02/06/96	20+ f	0	20+ f	0	0	0	0	0
04/06/96	0	0	0	0	0	0	0	0

Table 4.42: Numbers of alatae caught in sticky traps per day in 1996 at Dimsdale and Halse. Three sets of sticky traps used

m = alate males, f = alate queens

	Dimsdale					Halse		
	10D	11D	12D	13D	14D	1H	7H	9H
Sticky traps								
20/05/96	0	0	0	0	0	2 m	0	0
21/05/96	0	0	7 m	0	0	44 m	0	0
25/05/96	5 m	0	1 m	0	0	0	0	0
Netting								
26/05/96	0	0	0	0	0	0	0	0
27/05/96	0	0	0	0	0	1 m	0	0
28/05/96	42 m	0	0	0	0	91 m	0	0
Sticky traps								
30/05/96	40 m	0	18 f	2 f	0	25 m	0	0
02/06/96	20 m	0	4 f	0	0	5 m	0	0
04/06/96	23 m	0	9 f	0	0	15 m, 2 f	0	0

4.4 Discussion

Baiting is a quick, simple method which has been used extensively in studies on ants (Risch and Carroll 1982; Hölldobler and Wilson 1990, p. 398) and would have been a useful technique to help determine colony limits if baits had been equally attractive all year round. However, the comparison of the mean number of *F. rufa* on sugar baits with the median values of the foraging activity on the trees shows that the baiting reflects numbers of *F. rufa* for the months November to May, but not June to October. There was an interesting rise in numbers on sugar baits in mid July 1995. This coincides with the switching from foraging on oak to foraging on beech (sections 4.3.2.1 and 4.3.3.1) and is only seen for the short period of time when foraging in beech trees peaked. It would be better to compare the results of sugar baiting to an unbiased measure of numbers of *F. rufa* such as quadrats or numbers caught in pitfall traps rather than a potentially biased measure like foraging activity on trees. Although such measures were undertaken in this study, they were not frequent enough to make a comparison with relative numbers of *F. rufa* on sugar baits.

Tinned tuna and dried cat food were attractive to *F. rufa* when 1 M sucrose solution was not, but numbers of *F. rufa* seen on such baits were inconsistent. It was impossible to get an even size distribution of particles and the number of individuals recorded on a bait seemed to be governed by the "handling time". Small particles were quickly carried away, whilst larger particles required two or three *F. rufa* to transport away or cut up into manageable sizes *in situ*. Estimating the percentage of bait remaining was also a problem, as it was difficult to put down exactly equal quantities of bait. Baits could have been weighed before they were put out and at specified time intervals, but the results would have been affected by this "handling time" effect.

The fact that wood ants do not gather at sugar baits during the summer months is well documented (Rosengren and Fortelius 1987; Sudd and Sudd 1985) yet it has still not been satisfactorily explained. Sudd and Sudd (1985) found that *F. lugubris* will accept artificial sugar baits on the ground in the spring and early summer but not from midsummer onwards. However in the summer, they found that *F. lugubris* could be persuaded to take sucrose at high concentrations (about 1 M) if offered as a droplet near tended aphids. They claim that workers running on the ground did not stop to examine sugar baits. In this study, *F. rufa* workers were seen to stop and briefly examine sugar baits but not to feed from them. The fall in numbers gathering at sugar baits coincides with the appearance of *F. rufa* sexuals in each of the three study years.

The median graphs for the grids (Figure 4.6 to Figure 4.11 and Figure 4.23 to Figure 4.28) and for the study sites as a whole (Figure 4.40 to Figure 4.43 and Figure 4.54 to Figure 4.57 show similar seasonal patterns, the onset of foraging shows as a sudden increase in foraging, a build up towards a maximum in the summer and a slow decline to winter. Foraging on beech is fairly constant at a low level, the exception being July 1995 when large numbers of *F. rufa* switched away from foraging in oak trees to foraging in beech trees. This phenomenon was not seen in 1994. Foraging on silver birch is important from April to July. After July foraging declines to a very low level.

Oak always has a high percentage of available trees foraged, close to a nest (Figure 4.12 and Figure 4.13; Figure 4.29 and Figure 4.30), within foraging areas (Table 4.24 and Table 4.35) and over the study sites as a whole (Table 4.19 and Table 4.30) which reflects its importance as the host plant of the main source of honeydew for *F. rufa*, *L. roboris*. The number and species of tree found in individual foraging areas of *F. rufa* reveal a wide variation. Despite the known importance of *L. roboris* as a source of honeydew, there are successful colonies such as 11D and 4-5H, with low numbers of oak trees in comparison to other colonies. However, the data from the mean distance travelled to beech and oak trees shows that workers may travel further to oak trees, particularly if they are heavily foraged. In Halse the density of oak trees is lower than in Dimsdale (Table 4.43), which may be why the workers travel further to oak trees in Halse as compared to Dimsdale.

Table 4.43: Density of beech and oak trees in Dimsdale and Halse

Density / m^2	Dimsdale	Halse
Beech	0.0051	0.0047
Oak	0.0060	0.0045

Skinner (1980a) found seasonal variation in the utilisation of trees by *F. rufa* in the UK. He assessed numbers of workers on trees using a similar six point scale to the current study. His results showed the importance of sycamore in the spring. In the summer and autumn oak and Scots pine were more important. These differences were explained by the changing abundances of honeydew-producing aphids on the trees. Blanford (1994) found that the proportion of unforaged to foraged trees within 20 m of *F. rufa* in Burnham Beeches showed 50 % of beech trees and 86 % of oak trees were foraged and twice as many *F. rufa* ascended oak trees as beech trees. Rosengren and Sundström (1991) found the mean distance from a *Formica aquilonia* complex nest to the 30 most visited pines over a ten year study period was 17 m. The mean distance to the 30 least visited pines over the same study period was 28 m.

The work on repetitive foraging close to nest (Table 4.8, Table 4.9, Table 4.12 and Table 4.13) shows that there is extremely high fidelity of foraging on oak between corresponding months in different years; for example in April the same core of trees is visited in each year. Fidelity on beech trees is also high but the actual numbers of trees involved are much lower.

This study shows that continuous foraging on beech and oak is very different. Continuous foraging on beech trees is very low in comparison to oak trees. Elton (1932) recorded that some oak trees were foraged in three consecutive years by *F. rufa*. Skinner (1976) does not specifically analyse the composition of trees in the foraging areas of *F. rufa* nests, but he does comment in the discussion (p. 110) that "*In the territory of nest 2, for example, there are 48 trees which would presumably provide food, but only 20 of them are utilised extensively. In the case of nest 3, however, all the trees in the supposed territory are used*". It should be noted that nest 2 had a territory of

1,616 m^2 and nest 3 had a territory of 640 m^2. Rosengren and Sundström (1987) found a total of 300 trees were visited by a *Formica polyctena* colony over a six year period. Only 100 to 150 trees were visited every year. In June and September 1985, 60 % of all visits were made to fifteen trees, but only five were the same during the two surveys. Wellenstein (1952) states from observations in several locations, an average of 40 % of trees in an area were visited continuously by red wood ants, and 4 to 5 % were particularly favoured. No other details were available. In comparison with this study in Dimsdale (4.3.2.1) and Halse (4.3.3.1), 40 % is a high value, particularly if there is no differentiation between tree species in the area. The figures of 4 to 5 % being particularly favoured do equate well with the findings of the current study of heavy foraging on oak trees (abundance category 3 or above). Southwood (1961) lists the number of insect species found on different species of tree in Britain. Oak supports the highest with 284 species. Birch is also high, supporting 229 species. In comparison beech supports only 64 species. Therefore the potential number of prey species is much lower on beech. This may be part of the reason why oak is foraged more heavily than beech.

The constancy of foraging graphs (Figure 4.14 to Figure 4.21 and Figure 4.31 to Figure 4.38) showed all large trees in the grid areas are foraged more often than smaller trees. The results of the correlations of the abundance of *F. rufa* on different sized trees of individual species over the whole of the study sites (Table 4.18 and Table 4.29), show that *F. rufa* has a clear preference for larger trees of any species, although oak is preferentially foraged.

Weseloh (1995) correlated ant traffic for two species of *Formica* on nine different tree species with tree diameter in Connecticut, USA. No significant correlations were found with black birch, American beech, red or sugar maple, white oak or witch hazel. He found significant, positive correlations for *Formica neogagates* Emery on Chestnut oak and hickory, and *Formica subsericea* Say on Red-black oak. He concluded that ants find more resources in larger trees.

The maps (Figure 4.44 to Figure 4.52 and Figure 4.58 to Figure 4.66) show how the size and shape of foraging areas varies through the season. The high foraging on beech trees in July 1995 shows as a reorientation of the foraging areas so as to include more beech trees. Sections 4.3.2.1 and 4.3.3.1 showed that there was a corresponding decrease in heavy foraging on oak at this time. As will be seen in the following chapter, this corresponds to a period when there were extremely low numbers of *L. roboris* (Figure 5.6). A smaller drop in oak foraging was also seen in July 1994.

Continuous seasonal change in foraging area boundaries has been shown by a number of authors (Yasuno 1965; Mabelis 1979a; Skinner 1980b; Rosengren and Sundström 1987; Herbers 1989; Rosengren and Sundström 1991 and a review by Baroni Urbani 1979). This study shows the extreme variability of foraging areas both for different nests and for the same nest in different months of the year. The foraging areas are zero in winter (although very small numbers of foragers are often seen on the ground, but not in the trees), expand rapidly in the spring to reach a maximum in the summer, declining

slowly through autumn to zero again in the winter. There is much variability throughout the year in the shape of the foraging area, although an area of low activity always seems to be maintained between unconnected nests during spring, summer and early autumn. Even on a daily basis there will be variation. Skinner (1980b) and North (1993) have both shown a diurnal rhythm in *F. rufa* in the UK and as the number of foragers rises and falls, so the foraging area will expand and contract.

In this study summer territory sizes range from 491 m^2 to 3,283 m^2 (6,866 m^2 for a polydomous colony) for August 1994 and 709 m^2 to 4,901 m^2 (6,955 m^2 for a polydomous colony) for 19th July 1995.

Skinner (1980b) gives approximate sizes for eight nests in the summer 1973. Trails were mapped in the spring of 1974; no territory sizes are given for comparison, although it is clear from the trail pattern that the territories are smaller than for the previous summer. The territory sizes are very variable ranging from 272 m^2 to 1,280 m^2.

Table 4.44: Approximate summer territory sizes of *Formica rufa* nests from Skinner (1980b)

Nest	1	2	3	4	5	6	7	9	Mean
Area / m^2	272	1,616	640	748	1,280*	900	320	480$^+$	782

* part territory only, $^+$ rough estimate

Wellenstein (1952) quotes a number of authors whose territory estimates range from 1,000 m^2 to 3,400 m^2 for wood ants. Jensen (1978) estimates the territory of a *Formica pratensis* colony to be 2,508 m^2. Mabelis (1979a) measured the foraging areas of eighteen *F. polyctena* nests in 1968 and 1971; twelve nests were common to both years. The area of a territory in July (maximum size) ranged from approximately 200 m^2 to 3000 m^2 in 1968, and 250 m^2 to 4500 m^2 in 1971. He also mapped in detail the changes in foraging area from April to September 1967. Whilst territories were generally smaller in the spring, rising to a maximum in July, territories both expanded and contracted during the period April to July due to frequent boundary wars between neighbouring colonies which often caused extensive changes to the size and shape of territories. Rosengren and Sundström (1987) measured the foraging area of *F. polyctena* nest as 3,000 m^2 in the autumn and 6,000 m^2 in the summer. Rosengren and Sundström (1991) measured the size of the foraging area of a *F. aquilonia* complex nest as 5,000 m^2 in the summer and 3,300 m^2 in the autumn.

The foraging area of nest 10D changes seasonally (Figure 4.53), but notable changes between years were not seen. Thus, there is no clear evidence that food supplementation of the colony had any effect on its foraging pattern. It is possible that the fact that 10D was surrounded by other nests on all sides prevented any major foraging area increase. The results from the quadrats show that food supplementation of the colony did not increase or decrease the number of foragers relative to the control site.

A significant proportion of the energy requirements of the colony were artificially supplied (which will be more fully discussed in chapter five). Theoretically, therefore, less foraging effort was required to satisfy its energy needs. The fact that there was no decrease in foraging effort suggests that *F. rufa* foraging behaviour is not controlled solely by the amount of food available to the nest. An increased amount of food on one occasion, does not guarantee an increased amount of food on subsequent occasions. Not decreasing foraging effort in response to short-term increases in food supply is a sound evolutionary strategy.

There are a few examples of experiments where the foraging behaviour of food supplemented colonies has been studied. Ryti and Case (1988) found that foraging activity did not change with their food addition and neighbouring nest removal experiments. Weseloh (1996) found that the number of ants seen foraging was similar in food supplemented plots and control plots. He speculated that numbers of foragers might only increase a year after supplemental foods had been supplied. Deslippe and Savolainen (1994) found the maximum foraging distance of fed and control colonies was not significantly different suggesting that food supplementation had no effect on foraging behaviour. Horstmann (1972) found a natural outbreak of *Tortrix viridana* (Linnaeus), which resulted in a larger amount of prey brought back to the nest, did not affect the number of *F. polyctena* workers foraging or the amount of honeydew collected.

Sudd (1987) found that acceptance of prey by wood ants in spring is reduced if sucrose is also offered, as in the spring the colony's need for carbohydrate is greater than its need for protein. In summer, prey is usually preferred.

There is some evidence that grease-banding trees within 25 m of the nest forced *F. rufa* workers to forage further north beyond the grease-banded area. On three dates (in 1995 and 1996), the relative value of the foraging area (Table 4.33) was the highest of all the nests in Halse. Most of the significant increase in foraging is to the north of nest 9H (Figure 4.66). Foraging further south was not possible because the trees were grease-banded up to the edge of a road. The results from the quadrats show that reducing the food supply to the colony did not increase or decrease the number of foragers relative to the control site.

The grease-banding was not a complete success, particularly for oaks which had deep crevices in the bark. There were problems with *F. rufa* finding alternative routes into the tree canopy by utilising adjacent vegetation. Schmutterer (1956) also found that trees close together must all be greased otherwise the ants will find a route to the aphids. It was not possible to cut down vegetation because Burnham Beeches is a National Nature Reserve and an SSSI. In hindsight the area grease-banded should have been bigger because the impact on the behaviour of *F. rufa* was surprisingly limited.

Whittaker (1991, p. 70) discusses experiments in Canada where aphids were removed by insecticides and immediately *Formica obscuripes* Forel extended their foraging area and began to tend new colonies.

There are differences between the numbers of alatae seen on the surface of the nest and the numbers trapped, although both show the same overall pattern. The sticky traps caught relatively few individuals, even when confined by the netting compared to the numbers recorded on the nest surface. However, sticky traps have the advantage of being continuous, whereas a visual assessment is just one point in time. There was also a "time lag" effect with the sticky traps. At nest 12D, alate queens appeared on the surface of the nest 3 days before any were caught in a sticky trap. The results from both years show that the male alatae emerged before the alate queens, as seen also by Klimetzek and Faas (1994, p. 509) and Adams (1991, p. 200). Nielsen (1978), working with *Lasius alienus* (Förster), found that numbers of sexuals trapped by netting were half the numbers counted by physically removing sexuals from nests. Although the latter is a more effective method, the nest is destroyed. Jensen (1978) used tents to collect emerging alatae of *F. pratensis,* although he noted that the extent to which the colonies were disturbed was unknown.

Only two nests, 10D (fed nest) and 12D (nest connected by trail to fed nest) produced alatae in both years. The numbers caught in sticky traps and seen on the nest surface for these two nests were also the largest. All the other nests produced alatae in either 1995 or 1996. The extra food supplied to nest 10D, could have provided extra resources which subsequently could be channelled into producing additional sexuals. In conclusion, this work shows that monitoring needs to take place over a number of years before a true pattern can be seen. Ideally, nest 10D should have carried on being fed to see what effect this had on sexual production in 1997. The pattern of alate production across all the other nests in the study sites should have been determined. Unfortunately this was not possible, but it would make an interesting future study. Other studies have shown that sexual production is variable. A study using *Lasius flavus* (Fabricius) by Pontin (1969) showed numbers of queens produced by nests were not the same every year.

In the wood ant group only the largest colonies produce sexuals (Brian 1979, p.165). Klimetzek and Faas (1994) found that only nests above 0.75 m in diameter produced alatae in the *F. rufa* group. In their survey of 112 *F. rufa* nests, thirty produced alatae (27 %): fifteen alate queens only, eight alate males only and seven with both sexes. The proportion of nests producing alatae was seen generally to decrease with polydomy. On swarming days between 100 and 300 alatae were seen on the surface of a nest. The temperature of the nest at the time the eggs were laid plays an important role in determining what sex the alatae will be. At low temperatures, the eggs will not fertilise, thus very sunny nest sites often produce only females and shaded nests only males (Wilson 1971; Klimetzek and Faas 1994). If there is a food shortage during the first days of larval growth, the male larvae will die and only workers will be produced from the diploid winter egg larvae. The figure of Klimetzek and Faas (1994) of 27 % of nests

producing alatae is similar to this study. Of the nests which produced alatae in this study, only two (one in 1995 and one in 1996) are less than 0.75 m in diameter.

There is little literature on experiments to investigate the possible link between alate production and food supply. The most comprehensive was carried out by Deslippe and Savolainen (1994). Working with *Formica podzolica* in Canada, a temperate grassland species, they fed fifty colonies and had fifty controls in overgrazed meadow (invertebrate poor). They excavated these nests and fifty more along forest edges (invertebrate rich). Results showed that fed colonies in overgrazed meadow produced more alatae than control colonies. However there was no significant difference between fed colonies and colonies along forest edges. Richness of habitat was determined by the natural supply of invertebrates as measured through pitfall trapping. Backus and Herbers (1992), working with *Leptothorax longispinosus*, found that protein supplementation experiments in the field and the laboratory showed increased male alate production but not female. There is some evidence in the literature to suggest that removing neighbouring colonies leads to increased alatae production in the remaining colony. Ryti and Case (1988) working with two granivorous desert ant species (*Veromessor pergandei* and *Pogonomyrmex californicus*), gave food supplements to some colonies and removed neighbouring ant colonies from other colonies. Colonies with neighbours removed and food supplemented colonies produced more alatae than control colonies. Pontin (1969) also removed neighbouring colonies of *L. flavus* and found increased queen production in the remaining colonies.

Chapter 5: Distribution and abundance of *Lachnus roboris* and transport of honeydew by *Formica rufa*

5.1 Introduction

The work done in chapter four in establishing foraging areas allows the calculation of the amount of energy moved across foraging areas of *Formica rufa*, since all food collected by *F. rufa* is brought back to the nest.

Food collection by *F. rufa* falls into two categories: arthropod prey comprising mainly insects which provides the principal source of protein; and honeydew collected from aphids, which provides carbohydrate. Resources did not permit an attempt to experimentally measure the amount of arthropod prey collected by colonies, instead estimates from the literature were used in calculations. Therefore, the experimental work was confined to determining the honeydew load transported by *F. rufa*.

The collection of honeydew from Homoptera is widespread amongst ant species and probably dates back to the Oligocene (Vowles 1955; Way 1963; Carroll and Janzen 1973, p. 238). Honeydew collected from tended aphids is the main source of carbohydrate for *F. rufa* (Skinner 1980a, p. 430). Observations during 1994 showed that on oak (*Quercus petraea*), *Lachnus roboris* was the most important aphid tended by *F. rufa* and on beech (*Fagus sylvatica*), *Lachnus pallipes* (Hartig). A survey was conducted in 1995 to investigate the distribution of *L. roboris* and *L. pallipes* in relation to that of *F. rufa*. In 1995 and 1996, a study was made of the phenology of *L. roboris* and the relationship between the changing availability of honeydew and the foraging behaviour of *F. rufa*. In 1996, a study was also done to quantify the amount of honeydew collected by individual *F. rufa*. From this data an estimate was made of the amount of energy transported to *F. rufa* colonies in each site.

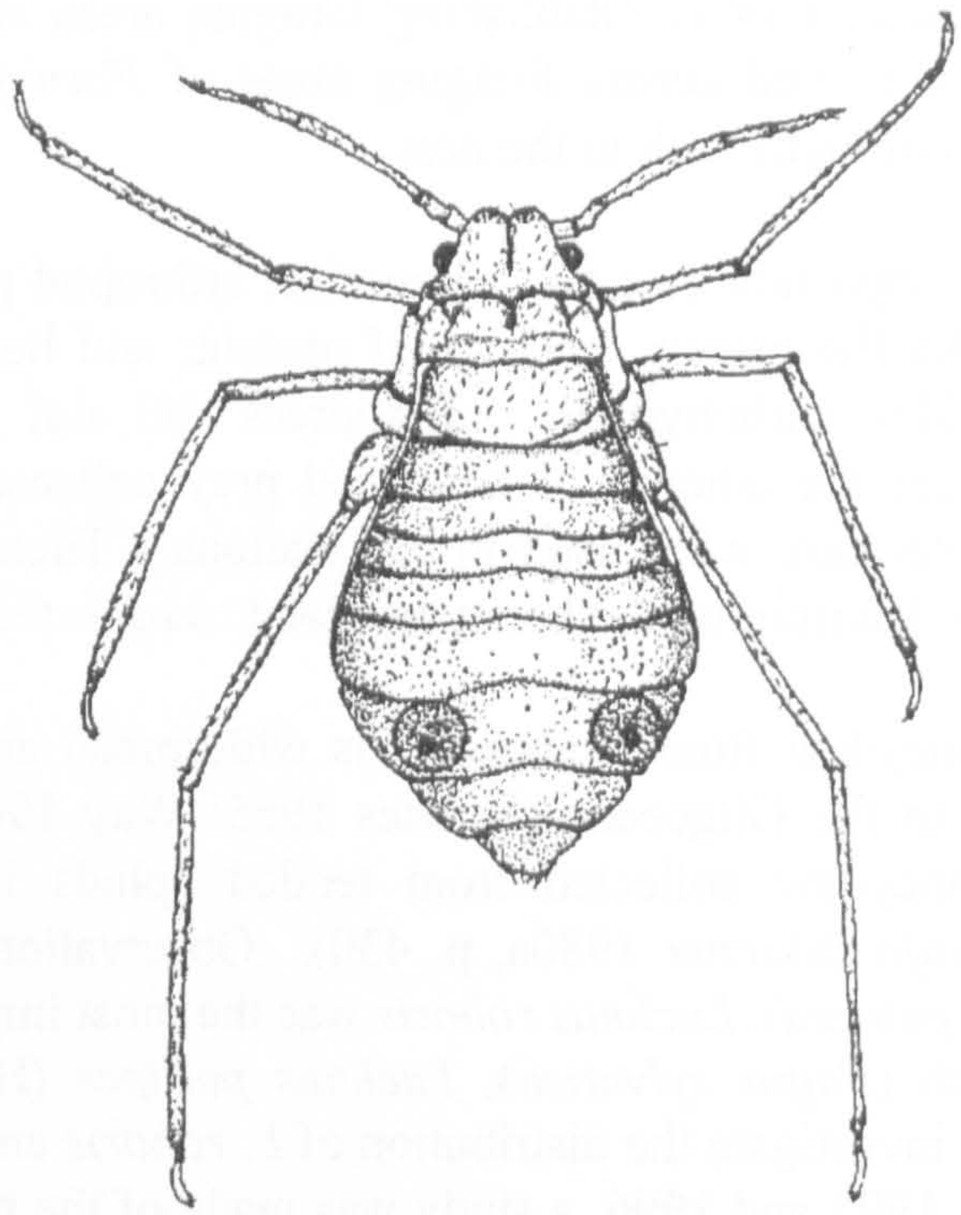
5.2 Biology of Lachnus roboris

L. roboris belongs to the family Aphididae, subfamily Lachninae. Blackman and Eastop (1994) describe the basic characteristics and biology of the Lachninae. They are medium to large aphids and with the alatae usually having distinctive pigmented wings. There are 15 known species, but it is a taxonomically difficult genus. Most have host trees in the family Fagaceae and are ant attended. *L. roboris* is likely to be a complex of species with different host plant associations (Blackman and Eastop 1994, p. 733).

L. roboris apterae are shiny blackish-brown with a body length varying between 3.5 mm and 5 mm (Figure 5.1). The alatae have a pigmented forewing membrane. *L. roboris* is distributed widely, in Europe east to the Ukraine, the Mediterranean region and Lebanon. *L. roboris* is found on twigs and small branches of *Quercus* spp. (Figure 5.2 and Figure 0.3). *L. roboris* is cyclically parthenogenetic (sexual generations alternating with parthenogenetic generations) on the same host plant (monoecious) (Blackman and

Eastop 1994, p. 732). Being monoecious allows for a close association with ants throughout the year, even though it is cyclically parthenogenetic (Way 1963, p. 312).

Figure 5.1: Line drawing of an apterous *Lachnus roboris* reproduced from Michel (1942, p. 246). Magnification x10.



A comprehensive study on the biology of *L. roboris* was conducted in Germany by Michel (1942). He found *L. roboris* living in large colonies tended and actively protected by *F. rufa*. Eggs, laid the previous autumn, hatched in the middle of April at approximately the same time as the buds opened. Once the chitin had hardened, the fundatrices were able to suck sap (within the first 24 hours). The fundatrices moulted for the first time 4 to 5 days after birth. Three more moults occurred before adults were formed. Progeny were produced from late May. In the laboratory, each fundatrix produced, on average, 18 progeny and lived for 10 to 14 days at 19°C. Subsequent generations were densely aggregated in colonies of 5 to 60 individuals. Subsequent adults were identical to the fundatrices except that they produced slightly fewer offspring and moulted only 3 times instead of 4. Seven generations were recorded during one season. In the 2nd, 3rd and 4th generations a few alate viviparae were produced. The last generation, about the middle of September comprised apterous oviparae and alate males. Mating occurred and the oviparae then laid eggs and died. The life cycle is shown in Figure 5.4.

Figure 5.2: *Lachnus roboris* colony on *Quercus petraea* (photograph taken May 1995)

Figure 5.3: Close up of *Lachnus roboris* colony on *Quercus petraea* (photograph taken May 1995)

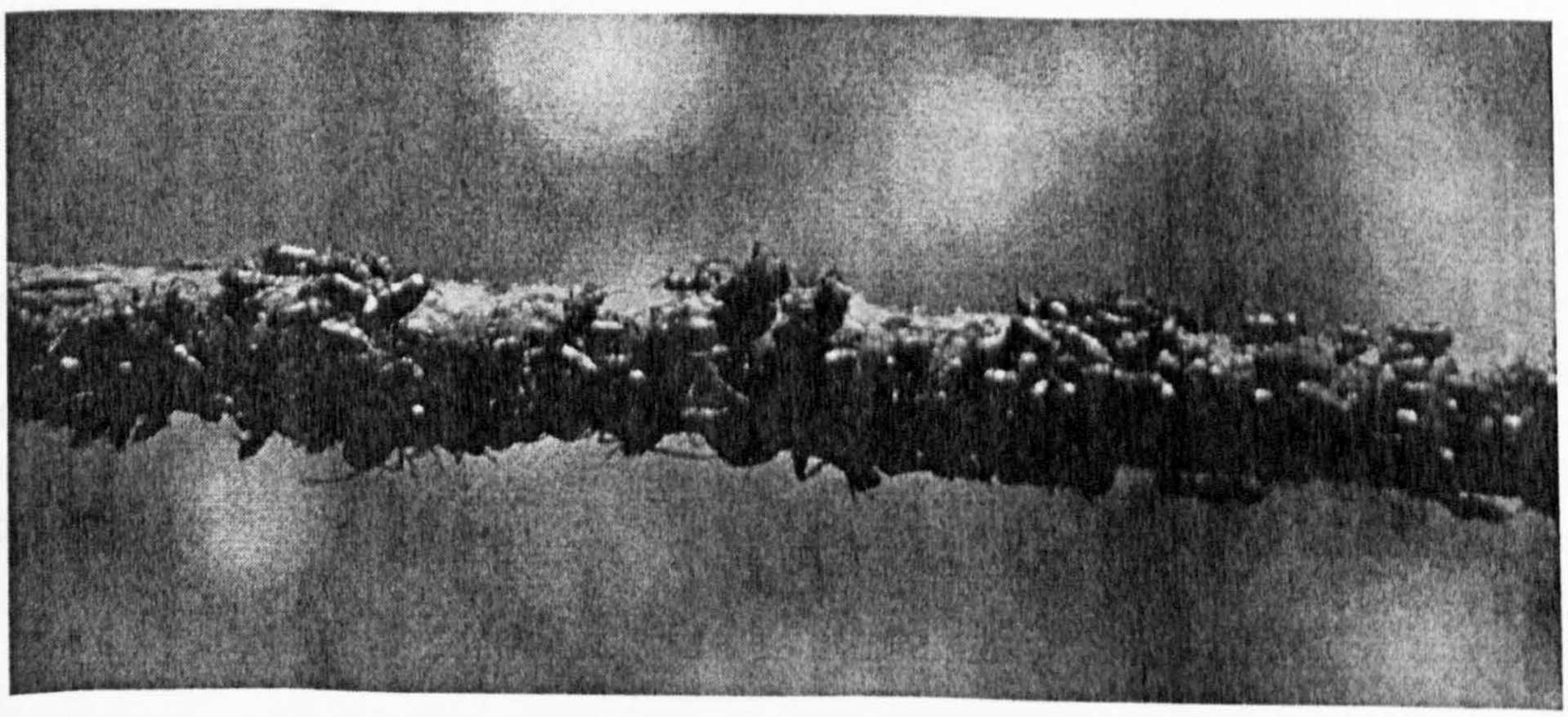
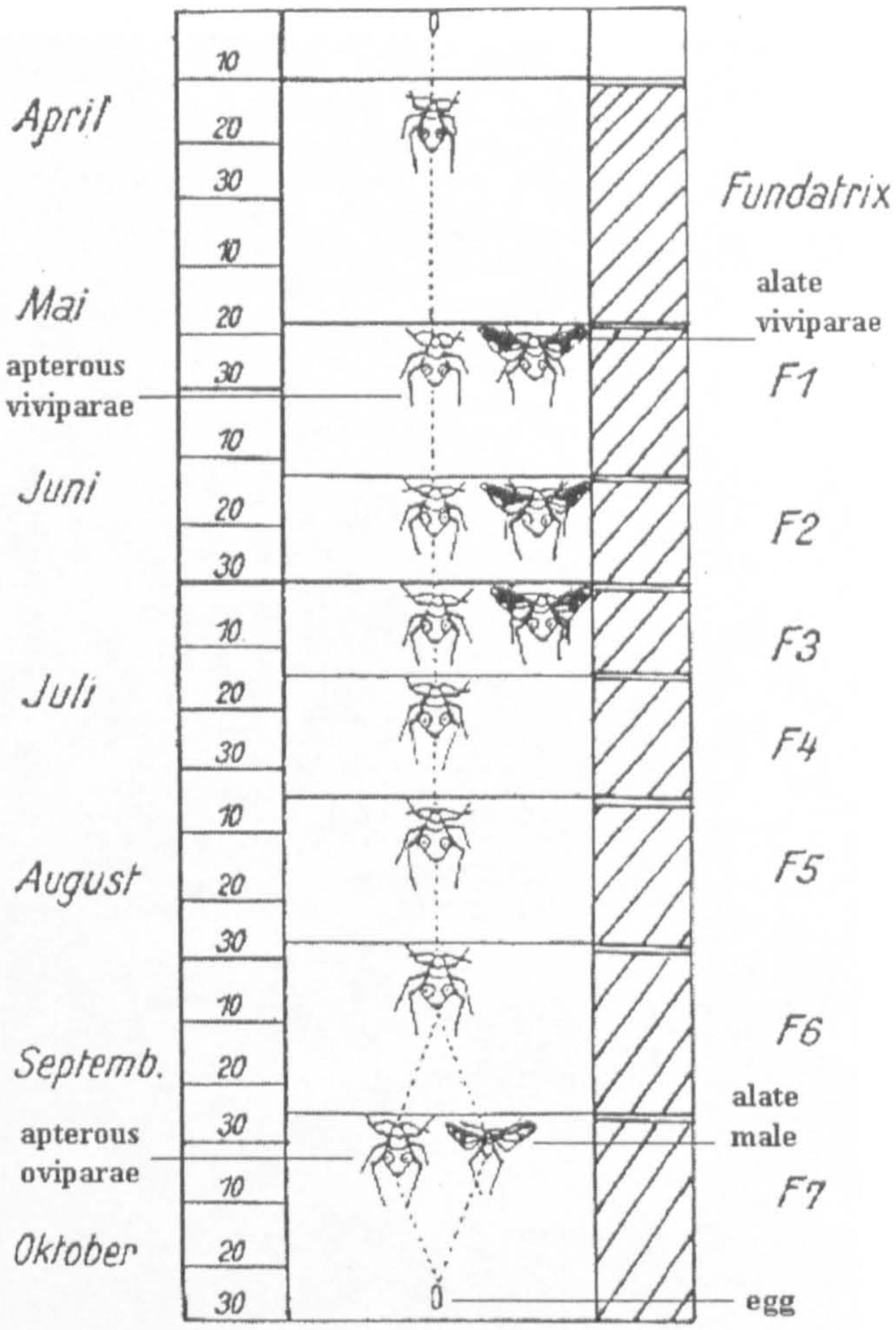


Figure 5.4: Life cycle of *Lachnus roboris* reproduced from Michel (1942, p. 256).



5.3 Methods

5.3.1 Observations on ant-tended aphids on different tree species

In 1994 observations were made in order to identify the species of aphid attended by *F. rufa* on the different tree species.

5.3.2 Distribution of Lachnus roboris *and* Lachnus pallipes

The overall distribution of *L. roboris* and *L. pallipes* was compared in relation to whether *F. rufa* was present or absent. Surveys were done on the 10th May 1995 and 25th October 1995. In an area where *F. rufa* was present, 20 oak trees were randomly selected. On each one a lower branch was randomly selected and carefully examined for the presence of *L. roboris*. This was repeated for *L. pallipes* on beech. The process was repeated for an area where *F. rufa* was absent.

The species of oak found in the areas where *F. rufa* is present is mainly *Q. petraea* and the areas where *F. rufa* is not found is mainly *Quercus robur* L., so it was not possible to sample all of one species or equal numbers of each. However, *L. roboris* is known to occur on both tree species (Blackman and Eastop 1994, pp. 398-399), so differing oak species should not affect *L. roboris* distribution.

5.3.3 Phenology of Lachnus roboris

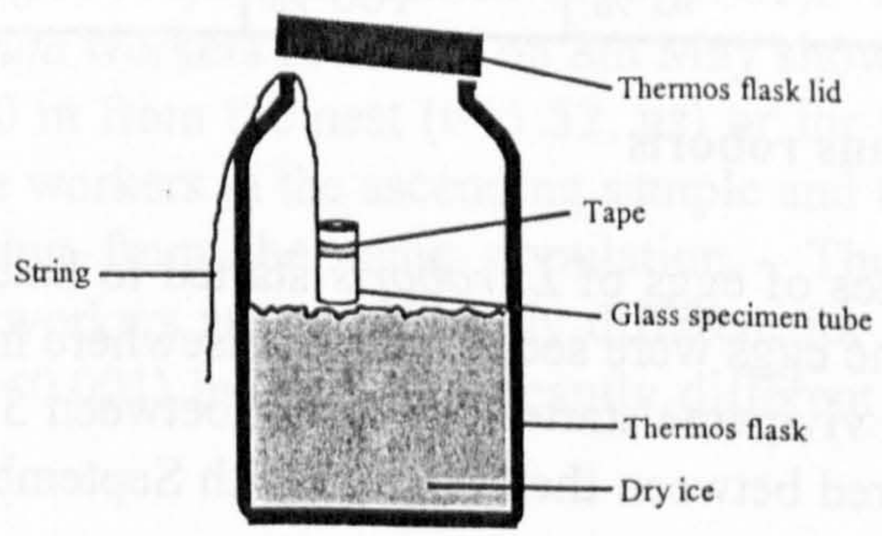
During February 1995, the lower branches of oak trees were examined for the presence of *L. roboris* eggs. Three egg batches were marked with coloured tape in each of three areas: Halse greased trees, Halse ungreased trees and Dimsdale. This procedure was repeated in February 1996.

Once the first eggs had hatched, the numbers of adults, progeny (of the first generation only), alates and eggs laid were recorded weekly until the population collapsed. Since the branches were unequal in size, the number of leaves on each branch examined was recorded, so for comparison the numbers of *L. roboris* were expressed per 100 leaves.

5.3.4 Honeydew transport by Formica rufa

During 1996 the amount of honeydew carried by *F. rufa* was estimated. The method was a modified version of Wright and Chukwu (*pers. comm.*). Dry ice was put in two 1 litre thermos flasks until they were about half full and the lids replaced but not screwed down. Labelled glass specimen tubes (50 mm by 25 mm) with string taped around the circumference of each and leaving a free end were placed in one of the thermos flasks (Figure 5.5). In the field, an individual *F. rufa* was collected using fine forceps and put in the glass tube which was then immediately lowered into the thermos flask using the string so that the *F. rufa* was killed virtually instantly by the cold. This method of collection has the advantage that desiccation of workers is minimised as is weight loss due to squirting of formic acid. The process was repeated until 50 individuals had been collected. The glass tube with *F. rufa* in was then transferred to the other thermos flask. Dry ice slowly evaporates but flasks remain sufficiently cold for three to four hours. Individual *F. rufa* were weighed as fresh weight using a four figure balance and head widths were measured using a microscope (x10 eye piece, x4 magnification) and micrometer.

Figure 5.5: Diagram of equipment used in collecting *Formica rufa*



F. rufa workers were collected on the 8th May and 10th July 1996. Four trees were selected on each occasion. Two trees were within 10 m of nest 1D and two more than 40 m away from nest 1D. In total 50 *F. rufa* ascending and 50 descending each tree trunk were randomly collected i.e. the descending workers, replete with honeydew, were not deliberately selected. *F. rufa* collecting prey were not selected, but very few were seen.

5.4 Results

5.4.1 Observations on ant-tended aphids on different tree species

On silver birch (*Betula pendula*), *Glyphina betulae* (Kaltenbach) was tended by *F. rufa* particularly in the early spring when it was the first aphid species to hatch. On oak, the most important aphid tended, in terms of population size, was *L. roboris* whilst *Thelaxes dryophila* (Schrank) was sometimes seen. On beech, *L. pallipes* was tended. In early Spring before *G. betulae* had hatched, *F. rufa* was seen licking exuding sap from silver birch and chewing at the base of the new buds.

5.4.2 Distribution of Lachnus roboris *and* Lachnus pallipes

The percentage of branches with *L. roboris* and *L. pallipes* are shown in Table 5.1.

Table 5.1: Distribution of *Lachnus roboris* on oak and *Lachnus pallipes* on beech in an area where *Formica rufa* is present and an area where it is absent

Sample of 20 lower branches of each tree in each area on 10/05/95 and 25/10/95.

		Oak		Beech	
		L. roboris Present	*L. roboris* Absent	*L. pallipes* Present	*L. pallipes* Absent
10/05/95	*F. rufa* present	75 %	25 %	10 %	90 %
	F. rufa Absent	0 %	100 %	0 %	100 %
25/10/95	*F. rufa* Present	60 %	40 %	25 %	75 %
	F. rufa Absent	0 %	100 %	0 %	100 %

5.4.3 Phenology of Lachnus roboris

In 1995, the labelled batches of eggs of *L. roboris* started to hatch between 26th April and 3rd May, although some eggs were seen hatching elsewhere in Burnham Beeches as early as 12th April. Alate viviparae started appearing between 31st May and 7th June and alate males first appeared between the 20th and 27th September. Egg laying began

between the 27th September and the 11th October. The last apterous oviparae died between 22nd and 29th November. In 1996, eggs began to hatch between the 27th April and the 1st May. Alate viviparae first appeared between 4th and 24th June. Monitoring stopped on the 24th June. The phenology is shown in Figure 5.6.

On the 11th May 1995, individual *L. roboris* were seen wandering on branches and trunks of several oak trees and a week later individual *L. roboris* were seen walking up and down branches and trunks of most of the oak trees; these wandering *L. roboris* were often taken as prey by *F. rufa*. The wandering *L. roboris* were most obvious on grease-banded trees as they collected in groups of hundreds, sometimes 1,000 - 2,000, below the grease-bands, obviously trying to ascend the tree. This behaviour continued until the beginning of June when no more wandering *L. roboris* were seen. In contrast, sedentary aggregated *L. roboris* were not attacked and continued to be tended for honeydew.

Dimsdale and the non-grease-banded trees at Halse showed similar numbers of *L. roboris* throughout the study (Figure 5.6). In contrast, numbers of *L. roboris* on greased-banded trees at Halse were much lower in the spring of 1995 and dropped off more rapidly. However, *F. rufa* was observed in the canopy beyond the grease-bands and was seen tending *L. roboris* on such trees. Numbers of *L. roboris* in the grease-banded area actually exceeded that of the non grease-banded areas in August and September 1995. Numbers of *L. roboris* in the spring of 1996 were considerably lower than in 1995. This was reflected across both study sites.

5.4.4 Honeydew transport by Formica rufa

5.4.4.1 Mean weight of honeydew carried by a *Formica rufa* worker

Mean weight (mg) and head width (mm) for ascending and descending *F. rufa* worker samples are shown in Table 5.2 and Table 5.3 respectively. The data is shown in Appendix H for 8th May and Appendix I for 10th July. The t-tests were computed for weights of ascending against descending *F. rufa* and for head widths (Table 5.4). In addition, data for samples within 10 m of the nest (2 samples) and samples greater than 40 m from the nest (2 samples) were pooled for each date and the t-tests repeated (Table 5.4).

Table 5.5 shows that in all cases weight is significantly positively correlated with head width for ascending and descending *F. rufa*. This confirms that head width is a good indication of weight in *F. rufa* (Savolainen 1990, p. 81). The head widths of ascending and descending *F. rufa* workers collected on 8th May show no significant difference for trees greater than 40 m from the nest ($t=-1.52$, ns) or for trees within 10 m of the nest ($t=-1.80$, ns), i.e. the workers in the ascending sample and the descending sample can be considered as coming from the same population. The weights of ascending and descending *F. rufa* workers are significantly different for trees greater than 40 m from the nest ($t=-3.35$, $p<0.001$) but not significantly different for trees within 10 m of the nest ($t=-1.57$, ns).

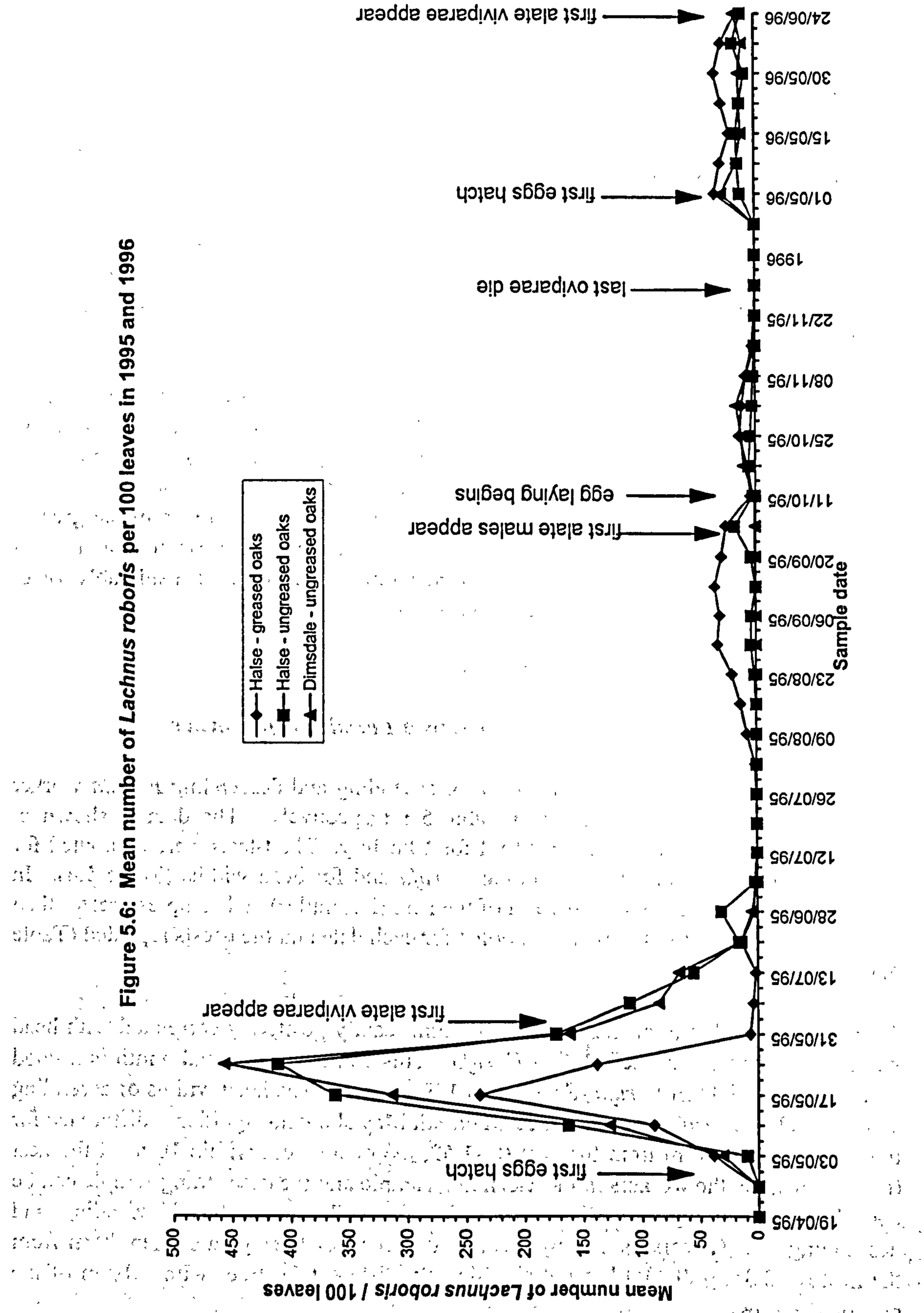


Figure 5.6: Mean number of *Lachnus roboris* per 100 leaves in 1995 and 1996

Table 5.2: Mean weights (±95 % confidence intervals) of *Formica rufa* ascending and descending oaks at different distances from the nest

Sample date	Tree number	Distance from nest	Number of samples	Ascending weight / mg	±confidence interval	Descending weight / mg	±confidence interval
08/05/96	Blue 319	>40m	49	6.8	0.7	7.6	0.7
	Blue 320	>40m	49	6.2	0.6	7.8	0.7
		>40m	98	6.5	0.5	7.7	0.5
	Red 70	<10m	50	5.2	0.5	5.5	0.4
	Red 60	<10m	50	6.3	0.6	6.9	0.7
		<10m	100	5.7	0.4	6.2	0.4
10/07/96	Blue 340	>40m	50	3.8	0.5	4.9	0.7
	Blue 331	>40m	50	6.3	0.7	8.1	0.8
		>40m	100	5.1	0.5	6.5	0.6
	Red 70	<10m	50	3.7	0.4	5.7	0.6
	Red 44	<10m	50	2.8	0.3	3.1	0.4
		<10m	100	3.3	0.3	4.4	0.4

Table 5.3: Mean head widths (±95 % confidence intervals) of *Formica rufa* ascending and descending oaks at different distances from the nest

Sample date	Tree number	Distance from nest	Number of samples	Ascending head width / mm	±confidence interval	Descending head width / mm	±confidence interval
08/05/96	Blue 319	>40m	49	1.60	0.05	1.60	0.05
	Blue 320	>40m	48	1.59	0.04	1.66	0.04
		>40m	97	1.59	0.03	1.63	0.03
	Red 70	<10m	50	1.51	0.05	1.57	0.05
	Red 60	<10m	50	1.48	0.05	1.51	0.05
		<10m	100	1.50	0.04	1.54	0.03
10/07/96	Blue 340	>40m	50	1.51	0.04	1.58	0.05
	Blue 331	>40m	50	1.51	0.05	1.58	0.04
		>40m	100	1.51	0.03	1.59	0.03
	Red 70	<10m	50	1.36	0.05	1.31	0.05
	Red 44	<10m	50	1.36	0.04	1.34	0.04
		<10m	100	1.36	0.03	1.33	0.03

Table 5.4: t-tests on ascending against descending weights and head widths of *Formica rufa*

ns (not significant), * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

			Weights		Head width	
Sample date	Tree number	Distance from nest	Ascending v Descending t statistic	Significance	Ascending v Descending t statistic	Significance
08/05/96	Blue 319	>40m	-1.41	ns	0.04	ns
	Blue 320	>40m	-3.45	***	-2.37	*
		>40m	-3.35	***	-1.52	ns
	Red 70	<10m	-0.96	ns	-1.86	ns
	Red 60	<10m	-1.33	ns	-0.72	ns
		<10m	-1.57	ns	-1.80	ns
10/07/96	Blue 340	>40m	-2.86	**	-1.93	ns
	Blue 331	>40m	-3.25	**	-2.03	*
		>40m	-3.71	***	-2.81	**
	Red 70	<10m	-5.48	***	1.35	ns
	Red 44	<10m	-1.04	ns	0.50	ns
		<10m	-4.29	***	1.35	ns

Table 5.5: Correlations of weight against head widths for ascending and descending *Formica rufa*

* $p < 0.05$, ** $p < 0.01$

Sample date	Tree number	Distance from nest	Number of samples	Ascending	Significance	Descending	Significance
08/05/96	Blue 319	>40m	49	0.75	**	0.76	**
	Blue 320	>40m	48	0.64	**	0.42	**
		>40m	97	0.70	**	0.61	**
	Red 70	<10m	50	0.66	**	0.71	**
	Red 60	<10m	50	0.68	**	0.71	**
		<10m	100	0.62	**	0.57	**
10/07/96	Blue 340	>40m	50	0.34	*	0.34	*
	Blue 331	>40m	50	0.49	**	0.48	**
		>40m	100	0.37	**	0.36	**
	Red 70	<10m	50	0.38	**	0.66	**
	Red 44	<10m	50	0.50	**	0.04	**
		<10m	100	0.41	**	0.28	**

For trees more than 40 m from the nest the mean weight of ascending *F. rufa* workers is 6.5 mg ± 0.5 mg. The mean weight of descending *F. rufa* workers is 7.7 mg ± 0.5 mg. The difference between the mean weights of ascending and descending *F. rufa* workers is 1.2 mg and can be used as an estimate of the mean load of honeydew returned to the nest per foraging worker.

The head widths of ascending and descending *F. rufa* workers collected on 10th July show no significant difference for trees within 10 m of the nest (t=1.35, ns), i.e. the workers in the ascending sample and the descending sample can be considered as coming from the same population. However, the head widths of ascending and descending *F. rufa* are significantly different for trees more than 40 m from the nest (t=-3.71, $p<0.01$), i.e. the workers in the ascending sample and the descending sample cannot be considered to come from the same population and this data cannot be used to calculate a mean weight of honeydew carried.

For trees within 10 m of the nest the mean weight of ascending *F. rufa* workers is 3.3 mg ± 0.3 mg. The mean weight of descending *F. rufa* workers is 4.4 mg ± 0.4 mg. The difference between the mean of ascending *F. rufa* and descending *F. rufa* is 1.1 mg and represents the amount of honeydew carried.

5.4.4.2 Estimating the total amount of honeydew transported back to a nest in one year

An estimate of the amount of honeydew transported to a colony in one year was calculated based on the whole site foraging counts for Dimsdale and Halse for 1995. There are a number of parameters:

s = average number of workers descending the tree per minute (Table 4.1)
f = frequency, the number of occurrences of each category of the abundance scale (s)
t = number of minutes in an hour
hf = number of foraging hours in a day (24 hour period) (Table 5.6)
d = number of days in the month
h = amount of honeydew carried

Therefore, the amount of honeydew transported back to nests in each site on a monthly basis (H) can be calculated as:

$$H = s.f.t.hf.d.h$$

For months where there are no foraging counts, H is estimated as the mean of the previous plus the following month.

Not all of the parameters of this equation have been measured. Thus, these calculations involve certain assumptions.

The number of hours spent foraging during a 24 hour period is variable and dependent on factors such as soil and air temperature. Average figures from Wellenstein (1952, Table 5.6) were used. In addition, a foraging period of 8 hours for November was estimated. Negligible foraging was assumed for December to March. Within each period, numbers of foragers rise and fall. Work done by North (1993) showed much longer periods of foraging for *F. rufa* in Burnham Beeches than recorded by Wellenstein in Germany, as did Skinner (1980b) for *F. rufa* in Lancashire. However, since the foraging counts, which determine *f*, were done when *F. rufa* was most active, this will tend to overestimate the amount of honeydew transported if all the hours when *F. rufa* forages are included. Thus using the lower values of Wellenstein (1952) for the number of foraging hours in a day (*hf*) should compensate for this. The amount of honeydew carried per individual also varies monthly as shown by this experiment and others such as Skinner (1980a). An average figure of 1.15 mg has been used.

Table 5.6: Total number of foraging hours in a day (24 hour period) for different months of the year

Taken from Wellenstein (1952) with the addition of November. Foraging in December to March considered negligible.

Month	Total number of foraging hours in a day (24 hour period)
April	10
May	12
June	15
July	15
August	15
September	12
October	10
November	8

The sum of the monthly values for *H* represent the total amount of honeydew carried to all the colonies within each study sites in one year and a value of kg m^{-2} can be estimated (Table 5.7). The total area of the Dimsdale study site is 33,440 m^2 and Halse is 30,552 m^2.

Nest sizes are very variable and a more accurate estimate for each colony can be obtained by calculating *f* for each colony's foraging area and using this to calculate *H* per colony. Only colonies active for the whole year whose foraging is wholly contained within the study sites were counted (8 in Dimsdale, 6 in Halse). These calculations are summarised in Table 5.8 for Dimsdale and Table 5.9 for Halse.

Table 5.7: Estimate of the number of kilograms of honeydew transported back to *Formica rufa* nests throughout the study sites Dimsdale and Halse for 1995

Month	Dimsdale kg of honeydew	Halse kg of honeydew
April	48.1	40.5
May	44.5	21.9
June	49.4	21.4
July	69.1	43.5
August	47.3	22.8
September	39.6	22.0
October	18.0	8.6
November	1.7	1.5
Total kg $year^{-1}$	317.7	182.2
Total kg $year^{-1}$ m^{-2}	0.01	0.006

Table 5.8: Estimate of the number of kilograms of honeydew transported back to individual colonies at Dimsdale by *Formica rufa* per year

Nests	kg of honeydew
1-5D	58.5
6D	15.3
9D	28.7
10D	47.6
11D	12.8
12D	26.9
14D	19.5
18D	24.2
Total kg $year^{-1}$	233.8
Average kg $year^{-1}$ $colony^{-1}$	29.2

Table 5.9: Estimate of the number of kilograms of honeydew transported back to individual colonies at Halse by *Formica rufa* per year

Nests	kg of honeydew
1H	28.8
2H	13.5
4-5H	15.9
7H	34.3
9H	28.9
11H	19.8
Total kg $year^{-1}$	141.2
Average kg $year^{-1}$ $colony^{-1}$	23.5

The carbohydrate composition of honeydew egested by *L. roboris* (and subsequently dried) was determined by Michel (1942, p. 274, Table 5.10). These figures were used to calculate an energy value for the annual total of honeydew transported per nest. For the purposes of the calculation, only the energy value for *L. roboris* on oak was used, although throughout the year honeydew is gathered from a number of different aphid species occurring on a number of different tree species. The energy values for mono- and disaccharides are from Southwood (1978). According to Auclair (1963, p. 465), it is thought that older texts classified oligosaccharides as dextrins, since the presence of dextrins has not been confirmed. Therefore, the energy value for polysaccharides from Southwood (1978) has been used for dextrine. No energy value could be found for melezitose. Since it is a trisaccharide (glucose-fructose-glucose chain), a value midway between that of di- and polysaccharides has been used.

Table 5.10: Carbohydrate composition of honeydew and energy value of honeydew excreted by *Lachnus roboris*

Composition from Michel (1942). Energy values for mono-, di- and polysaccharides from Southwood (1978).

Constituent	%	Energy kJ g^{-1}
Monosaccharides	19.1	15.5
Disaccharides	25.9	16.8
Melezitose	46.3	17.2
Dextrine	6.7	17.6
Honeydew	98	16.5

Work by Michel (1942) found that the daily production (24 hour period) of honeydew by *L. roboris* in the laboratory varied between 0.9 mg and 8.6 mg for mature adults. The sugar content was 20 %. In the field the daily production in August was 0.55 mg. Increased water evaporation from the outdoor collected honeydew meant the sugar content rose to 77.8 %. However, since honeydew is generally collected by *F. rufa* as it is egested it is unlikely that much evaporation occurs.

Therefore, assuming a sugar content of 20 %, the energy contained in 1 kg of fresh honeydew is 20 % of 16,500 i.e. 3,300 kJ. Therefore the total amount of energy transported per year in Dimsdale is 10.5×10^5 kJ (317.7 x 3,300) or 33 kJ m^{-2} $year^{-1}$ (0.01 x 3,300). For Halse 6.0×10^5 kJ (182.2 x 3,300) is transported per year or 19.8 kJ m^{-2} $year^{-1}$ (0.006 x 3,300). The number of kJ of honeydew transported by individual colonies are in Table 5.11 for Dimsdale and Table 5.12 for Halse.

Table 5.11: Estimate of the number of kJ of honeydew transported back to individual colonies at Dimsdale by *Formica rufa* per year

Nests	kJ of honeydew
1-5D	193,030
6D	50,650
9D	94,700
10D	157,140
11D	42,350
12D	88,730
14D	64,280
18D	79,790
Total kJ year^{-1}	770,670
Average kJ year^{-1} colony^{-1}	96,330

Table 5.12: Estimate of the number of kJ of honeydew transported back to individual colonies at Halse by *Formica rufa* per year

Nests	kJ of honeydew
1H	94,880
2H	44,450
4-5H	52,610
7H	113,040
9H	95,370
11H	65,260
Total kJ year^{-1}	465,620
Average kJ year^{-1} colony^{-1}	77,600

5.4.4.3 Estimating the total amount of insect prey transported back to a nest in one year

A literature review was carried out to provide an estimate the amount of insect prey brought back to the nest in one year by *F. rufa*. The values are summarised in Table 5.13.

Table 5.13: Summary of estimates from the literature on the amount of insect prey brought back to a nest by *Formica rufa* and related species in one year

Reference	*Formica* species	Estimated number of insects collected year^{-1}*	Estimated fresh weight of insects collected kg year^{-1}**	Estimated amount of dry matter collected kg year^{-1}***	Numbers of ants in nest
Adams (1991)	*rufa*	185 000	6.2		
Donisthorpe (1927)	*rufa*	18 000 000	600		up to 100 000
Eidmann (1930)	*rufa* group	3 600 000	120		
Galle (1976)	*pratensis*		38.26 to 66.19	13.08 to 22.63	workers 113 000 to 204 000
Gößwald (1958)	*rufa*	minimum 11 700 000	390		
Holt (1955)	Scottish wood ant *lugubris* or *aquilonia*		82		workers 70 000
Jensen (1978)	*pratensis*		25.65	11.03	workers 6 000 to 49 000 total population estimate 11 800 to 96 000
Økland (1930)	*rufa*		23	10	workers 100 000
Økland (1932)	*rufa*	64 000	2.1		
Pavan (1951)	*rufa* group	420 000	14		
Rosengren, Vepsäläinen and Wuorenrinne (1979)	*polyctena*	2 592 000			foragers 100 000

Table 5.13 continued

Reference	*Formica* species	Estimated number of insects collected year^{-1}*	Estimated fresh weight of insects collected kg year^{-1}**	Estimated amount of dry matter collected kg year^{-1}***	Numbers of ants in nest
Rosengren and Sundström (1987)	*polyctena*	5 000 000	167		workers 380 000 to 90 000
Rosengren and Sundström (1991)	*aquilonia* complex	5 000 000		7	foragers 380 000 (July), 270 000 (September), 90 000 (October)
Schwenke (1957)	*rufa*	85 000	2.8		
Schwenke (1957)	*rufa*	180 000	6		
Schwenke (1957)	*nigricans*	500 000	16.7		
Skinner (1980a)	*rufa*		11.1	2.39	
Stumper (1923)	*rufa*	6 220 800	207		
Wellenstein (1952)	red wood ant	8 000 000	267		

* quoted values vary by season, year or day. Where they are only quoted by day I have multiplied by 180 days as some of the other figures were quoted for this length of time for the season.

** Pavan (1951) quoted 420 000 insects as weighing 14 kg.

*** To approximately convert dry matter to fresh weight: multiply dry weight by 4.65 (Jensen 1978). Then assume half protein and half honeydew.

5.5 Discussion

5.5.1 Observations on ant-tended aphids on different tree species

The aphids tended by *F. rufa* in Burnham Beeches are commonly found in the UK and Europe. Wellenstein (1952, p. 448) has a table of 69 aphid species recorded as being tended by *F. rufa* which includes the four species seen regularly at Burnham Beeches. Adams (1991, p. 110) recorded *F. rufa* in Kent tending the same species as this study on oak and birch, with *L. roboris* on oak being the most important source of energy for *F. rufa*. Wellenstein (1952) believed that early Spring was a time of food shortage which accounted for their chewing at the base of buds and licking exuded sap. Elton (1932) saw *F. rufa* collecting sap from broken birch twigs in March. *Formica polyctena* is also known to collect sap from birch trees in early spring (Rosengren and Sundström 1987).

T. dryophila is known to occur on *Quercus* spp. and is ant-tended. It aestivates from June until September on the undersides of leaves and in the forks of veins (Blackman and Eastop 1994, p. 901). Sudd and Sudd (1985) found *Formica lugubris* tended *L. roboris* and *T. dryophila* on oak in Langdale Forest, North Yorkshire. *G. betulae* is known to be ant-tended and occurs in colonies on young shoots of *Betula* spp. or *Alnus* spp., especially *B. pendula*. Its life-cycle is abbreviated, with oviparae appearing in July and apterous males in August (Blackman and Eastop 1994, p. 706).

5.5.2 *Distribution of* Lachnus roboris *and* Lachnus pallipes

The survey showed neither *L. roboris* nor *L. pallipes* occurred outside the areas where *F. rufa* was present. Honeydew from *L. roboris* was the main source of energy recorded for *F. rufa* in Kent and the absence of *L. roboris* from a wood where *F. rufa* was not present was noted by Adams (1991, p. 172). *L. roboris* is an obligate myrmecophile (Sudd and Sudd 1985, p. 96). The abundance of *L. roboris* was higher in May than the abundance in October (see section 5.4.3) and this was reflected by the percentage of branches colonised by *L. roboris*. *L. pallipes* is known to be ant-tended (Blackman and Eastop 1994, p. 732), but was not found to be as common as *L. roboris* in Burnham Beeches.

5.5.3 *Phenology of* Lachnus roboris

Schmutterer (1956) noted that the fundatrices of *L. roboris* tend to stray at the end of May and many are eaten by *F. rufa*. Wellenstein (1952, p. 345) saw *F. rufa* killing crawling Lachninae on the ground.

Michel (1942) found *L. roboris* eggs hatching between 12th and 16th April 1939 on oak and on the 20th April the following year. Hatching occurred at the same time as the leaves came out. The last adults were seen at the end of October. Adams (1991, p. 110) found *L. roboris* eggs in Kent hatched on 23rd March 1989 and on the same date in 1990, and the last live aphid on the 8th December 1989. The results obtained at Burnham Beeches fit very well with the observations of Michel (1942) and Adams

(1991), with slight differences in timings which is probably due to the prevailing weather conditions, especially the air temperature. Sudd and Sudd (1985) found *L. roboris* eggs hatched between 12th and 19th May and aphids were tended by *F. lugubris* until 5th November. Schmutterer (1956) also looked at relationship between *F. rufa* and *L. roboris*. *F. rufa* started visiting *L. roboris* eggs in March. Numbers of tending ants rose as the size of the colony grew during late May and June, reaching a maximum in early summer.

During April and May and late August, September and October, honeydew is an important food source whilst in the period June to August, invertebrate prey is important. This not only correlates with the nutritional requirements of the colony, protein being required to feed a growing brood (Skinner 1976, p. 41), but also reflects the relatively small populations of aphids during much of the summer, as shown for *L. roboris* in this study. Skinner (1980a, p. 429) attributed changes in foraging activity on different tree species by *F. rufa* to changes in the abundance of honeydew producing aphids. Sudd and Sudd (1985) attribute changes in foraging behaviour to both changes in resource availability and to developmental changes within the ant colony.

5.5.4 *Honeydew transport by* Formica rufa

5.5.4.1 Weight of honeydew carried by a *Formica rufa* worker

The data analysis presented here is a simplification. It has been shown by Wright and Chukwu (*pers. comm.*) that larger *F. rufa* workers carry proportionally larger loads, therefore the relationship between load weight and head width is curvilinear. It has also been shown by Wright and Chukwu (*pers. comm.*) and Rosengren and Sundström (1987) that on average, smaller *F. rufa* workers forage in trees near the nest and larger *F. rufa* workers forage in trees at greater distances from the nest. Therefore, the honeydew load carried by a small *F. rufa* worker will be less compared to a larger worker and therefore the mean weight of ascending and descending workers may not show up to be significantly different using a t-test. This is a possible explanation of the results of the within 10 m of nest sample for 8th May which showed no significant difference in the weights of ascending and descending *F. rufa*. This problem has been overcome by Wright and Chukwu (*pers. comm.*) by plotting weight against head width and fitting log-log regression curves to each of the ascending and descending data. Then, all the unladen weights can be calculated for descending ants from the ascending (i.e. unladen) regression curve. The difference between the descending weight and the calculated unladen weight is the weight of honeydew carried. This method is sensitive enough to calculate the small loads of honeydew carried by the smaller *F. rufa* workers, as well as the relationship between increasing head width and honeydew load carried.

Such an analysis was not possible in this case because of the way the data was collected. The *F. rufa* workers were collected randomly and a proportion of those workers carried no honeydew. This is important in calculating how much honeydew is collected in total by a nest since the average weight carried per worker takes this into account. As a result, plots of weight and head width for ascending and descending *F. rufa* workers

from this study have widely scattered points to which regression curves cannot easily be fitted. The experimental work could have been improved by using the method of Wright and Chukwu to calculate loads more accurately in conjunction with collecting random samples to calculate the average load carried per trail.

Table 5.14 summarises information from the literature on the amount of honeydew carried by *Formica* spp. workers and the average weights of unladen workers. Skinner (1980a) found the average difference in dry weight between descending and ascending *F. rufa* workers varied with season. There was a peak in May which gradually decreased. The trend was the same for the estimated total amount of honeydew brought back to the nest.

The values of honeydew carried found by this study are the lowest; the values of Jensen (1978) and Holt (1955) are the closest. However, the average weights of workers quoted by the other authors are two to three times larger than this study. The very high value of Skinner (1980a) can be accounted for by his collection method. He sorted his workers into visibly replete and non-replete. Subsequent calculations were based only on replete workers. In contrast, Adams (1991), Holt (1955), Jensen (1978), Wellenstein (1952) and this study collected workers randomly. This gives a truer picture of the amount carried by the population as a whole, since a proportion of the workers return to the nest carrying nothing.

The average weight of an ascending individual in this study was only 6.5 mg for trees more than 40 m from the nest and 5.7 mg for trees within 10 m of the nest in May and 5.1 mg and 3.3 mg respectively in July. The difference in size supports the view of Wright and Chukwu (*pers. comm.*) that small ants forage near the nest and larger ants further away. McIver and Loomis (1993) working with *Formica obscuripes* and *Formica planipilis* Creighton in North America, found the smallest ants (0.8 mm headwidth) were found tending aphids within 1.2 m and 6.2 m from their nests. The largest ants (1.8 mm head width) were found tending aphids between 3.4 m and 11.7 m from the nest. The lower weights in July can probably be accounted for by the addition of small, newly emerged workers to the foraging effort whereas all the workers in the May count will be from the previous season. In July, the greater size range of workers is a possible explanation of why the far trees sample for 10th July showed a significant difference between the head widths of ascending and descending workers ($t=-3.71$, $p<0.01$). Not enough samples were collected to adequately sample from the possible size range. The ascending sample contained workers from the smaller end of the size distribution, whereas the descending sample contained workers from the larger end of the size distribution, with no overlap.

Table 5.14: Average weight of honeydew carried and average weights of unladen *Formica* spp. workers

* Where ranges of values are quoted, an average has been taken. + Dry weight values have been converted to fresh weight by multiplying by 4.65 (Jensen 1978)

Reference	Species of *Formica*	Average dry weight of honeydew carried per worker/ mg	Average fresh weight of honeydew carried per worker / mg	Average unladen dry weight of a worker / mg	Average unladen fresh weight of a worker / mg
This study	*rufa*		1.15*		5.15*
Adams (1991)	*rufa*		3.8*		8.9*
Holt (1955)	Scottish wood ant *lugubris* or *aquilonia*		1.9		9.8
Jensen (1978)	*pratensis*	0.4	1.86	2.84*+	14.2
Økland (1930)	*rufa*	1	4.65		
Skinner (1980a)	*rufa*	1.35*+	6.28		
Wellenstein (1952)	*rufa*	1.13*+	5.25	2.80+	14

5.5.4.2 Estimating the total amount of honeydew transported back to a colony in one year

Calculations of the amount of honeydew transported to a colony in one year vary considerably, not least because of the assumptions made along the way, the most uncertain being the number of workers in a colony. The number of workers also varies throughout the year. Jensen (1978, p. 216) found the number of *Formica pratensis* workers in the summer was three times the number found in the winter.

Table 5.15 summarises estimates from the literature on the amount of honeydew transported back to a colony in one year by *F. rufa* and related species.

The average estimates per colony from this study of 29.2 kg $year^{-1}$ and 23.5 kg $year^{-1}$ are similar to those of Jensen (1978), 25.65 kg $year^{-1}$ for *F. pratensis* and Økland (1930), 23 kg $year^{-1}$ and Adams (1991), 32.6 kg $year^{-1}$ for *F. rufa*. Individual colonies show a great variation and at Dimsdale the estimates per colony range from 12.8 to 58.5 kg $year^{-1}$ and at Halse from 13.5 to 34.3 kg $year^{-1}$.

Table 5.15: Summary of estimates from the literature on the amount of honeydew brought back to a colony by *Formica rufa* and related species in one year

Reference	*Formica* species	Estimated amount of fresh honeydew collected kg year^{-1}	Estimated amount of dry matter collected kg year^{-1} *	Numbers of ants in nest
Adams (1991)	*rufa*	32.6		
Galle (1976)	*pratensis*	27.14 to 46.96	13.08 to 22.63	workers 113 000 to 204 000
Holt (1955)	Scottish wood ant *lugubris* or *aquilonia*	83		workers 70 000
Jensen (1978)	*pratensis*	25.64	11.03^{+}	workers 6 000 to 49 000 total population estimate 11 800 to 96 000
Økland (1930)	*rufa*	23	10	workers 100 000
Rosengren and Sundström (1987)	*polyctena*	240		workers 380 000 to 90 000
Rosengren and Sundström (1991)	*aquilonia* complex	240		foragers 380 000 (July), 270 000 (September), 90 000 (October)
Skinner (1980a)	*rufa*	1430		
Wellenstein (1952)	red wood ant	minimum 200		
Zoebelein (1956)	*polyctena*	290 to 320		
Zoebelein (1956)	*nigricans*	450 to 500		

* To approximately convert dry matter to fresh weight: multiply dry weight by 4.65 (Jensen 1978). Then assume half protein and half honeydew.

$^{+}$ For the purposes of calculation Jensen divided the weight of dry matter equally between honeydew and insect prey i.e. 5.5 kg / year

The nests in Halse, on a visual scale of activity (Table 3.4), were less active and smaller in size than those in Dimsdale. The mean number of *F. rufa* caught per day in pitfall traps were consistently lower in Halse than in Dimsdale (Figures 6.3 and 6.4). These two facts may account for the lower amount of honeydew brought back overall and per nest there.

The accuracy of the calculations could be improved by more accurate estimation of the parameters. The number of foraging hours per day for different months of the year could be measured experimentally rather than estimated. The traffic during the day varies, which was not taken into account in these calculations. Estimating the number of workers per nest, which varies within a year, would also improve the accuracy. The amount of honeydew carried per worker varies from month to month. Using accurate amounts for each month would improve the accuracy of the calculations.

5.5.4.3 Estimating the total amount of insect prey transported back to a nest in one year

As for honeydew, there is a wide variation in the literature of estimates on the amount of insect prey brought back to a nest by *Formica* spp. Figures are quoted as dry weight, fresh weight or numbers collected for differing time periods. Some recalculation was necessary in order to produce comparable figures. However, these figures should only be thought of as approximate, since the accuracy of many of the original calculations is questionable. Studies such as Stumper (1923) made ten separate counts of one minute each of numbers of insect prey brought back to a *F. rufa* nest along one trail. To obtain a yearly estimate he multiplied the average of twelve by four (for the number of trails into the nest), multiplied by 24 for the number per day, decided they probably did not forage as much at night, therefore the number collected was 50,000 and therefore, for a season of 100 days, five million insects were collected. Thus he is claiming from one ten minute survey of one trail that one *F. rufa* nest collects five million insects per year. Clearly estimates such as this, where no consideration was given to factors such as the seasonal availability of prey or changes in the number of foragers or even variation in foraging within a day is likely to greatly overestimate the amount of prey collected.

Blanford (1994) details prey collected by returning *F. rufa* workers in Burnham Beeches, but figures are given for the number of items collected from individual oak and beech trees rather than by nest. An estimate of the weight of insect prey collected for an oak, 1.6 kg $year^{-1}$, and a beech, 0.9 kg $year^{-1}$, can be made, although it should be noted the sample sizes were small (eight for oak and seven for beech).

Estimates as to the relative proportions of honeydew and insect prey in the diet of *Formica* spp. vary. Jensen (1978) assumed equal weights of insect prey and honeydew in calculations. Work by Skinner (1980a) showed that for a single trail of *F. rufa* the amount of energy obtained from insect prey varied from 2 % to 37 % of the total (insect prey plus honeydew) depending on the time of year.

Using the different proportions of insect prey in the diet of *F. rufa* quoted by various authors, it is possible to calculate estimates for the amount of insect prey brought back to one colony at Dimsdale (Table 5.16) and Halse (Table 5.17). Using the value of 23.9 kJ g^{-1} as an estimate of the energy value of dry weight of prey from Southwood (1978), the total amount of energy derived from insect prey transported can also be estimated.

Table 5.16: Variation in the proportion of insect prey brought back to a colony at Dimsdale

Proportion of insect prey in diet	Average estimate of wet weight (dry weight) of insect prey brought back kg $colony^{-1}$ $year^{-1}$	Average estimate of energy value of insect prey brought back kJ $colony^{-1}$ $year^{-1}$
50 % (Jensen 1978)	29.2 (6.3)	150 200
38 % (Wellenstein 1952)	17.9 (3.9)	92 100
15 % (Skinner 1980a; Adams 1991)	5.2 (1.1)	26 500
5 % (Rosengren and Sundström 1991)	1.5 (0.3)	7 900

Table 5.17: Variation in the proportion of insect prey brought back to a colony at Halse

Proportion of insect prey in diet	Average estimate of wet weight (dry weight) of insect prey brought back kg $colony^{-1}$ $year^{-1}$	Average estimate of energy value of insect prey brought back kJ $colony^{-1}$ $year^{-1}$
50 % (Jensen 1978)	23.5 (5.1)	121 000
38 % (Wellenstein 1952)	14.4 (3.1)	74 100
15 % (Skinner 1980a; Adams 1991)	4.2 (0.9)	21 300
5 % (Rosengren and Sundström 1991)	1.2 (0.3)	6 400

5.6 Conclusion

The estimated total amount of energy (honeydew and prey) moved by *F. rufa* workers back to one colony in Dimsdale ranges from 104,300 kJ $year^{-1}$ (for insect prey as 5 % of the diet) to 246,700 (for insect prey as 50 % of the diet). At Halse the corresponding figures are 84,000 kJ $year^{-1}$ to 198,600 kJ $year^{-1}$. The estimated total amount of energy being moved around the whole site at Dimsdale ranges from 11.3 x 10^5 kJ $year^{-1}$, 33.9 kJ m^{-2} $year^{-1}$ (for insect prey as 5 % of the diet) to 26.8 x 10^5 kJ $year^{-1}$, 80.2 kJ m^{-2} $year^{-1}$

(for insect prey as 50 % of the diet). The corresponding figures for Halse are 6.5 x 10^5 kJ $year^{-1}$, 21.3 kJ m^{-2} $year^{-1}$ to 15.4 x 10^5 kJ $year^{-1}$, 50.3 kJ m^{-2} $year^{-1}$.

The food supplementation of nest 10D in 1995 (section 4.3.2) provided 65,407.5 kJ of carbohydrate, in the form of 1M sugar solution. Since the total estimated amount of honeydew brought back to 10D was 157,140 kJ $year^{-1}$ (Table 5.11), the food supplementation provided the equivalent of 42 % of the yearly intake of honeydew. 54,860 kJ of protein was supplied in the form of tinned tuna. The estimated amount of insect prey brought back to 10D ranges from 12,900 kJ $year^{-1}$ (for insect prey as 5 % of the diet) to 244,700 kJ $year^{-1}$ (for insect prey as 50 % of the diet). The food supplementation provided an equivalent of 426 % to 22 % of the yearly intake of protein.

Between 1.8 x 10^6 and 2.75 x 10^6 kJ m^{-2} $year^{-1}$ of photosynthetically active radiation (PAR) is incident upon a deciduous forest which is converted, with an efficiency of between 0.5 % and 1 %, into above-ground net primary productivity (NPP) (Begon *et al.* 1986, p. 638).

The proportion of NPP moved by *F. rufa* workers can be estimated as the amount of energy moved by *F. rufa* workers per m^2 divided by NPP. Using an average value for PAR of 2.275 x 10^6 and an average value of 0.75 % for the conversion efficiency of a deciduous forest gives a value of 17.06 x 10^3 for NPP. For Dimsdale the proportion of NPP moved is 0.20 % to 0.47 % (33.9/17.06 x 10^3 to 80.2/17.06 x 10^3) and for Halse, 0.12 % to 0.30 % (21.3/17 x 10^3 to 50.3/17.06 x 10^3).

Chapter 6: Influence of *Formica rufa* on the spatial distribution of other ground living invertebrates

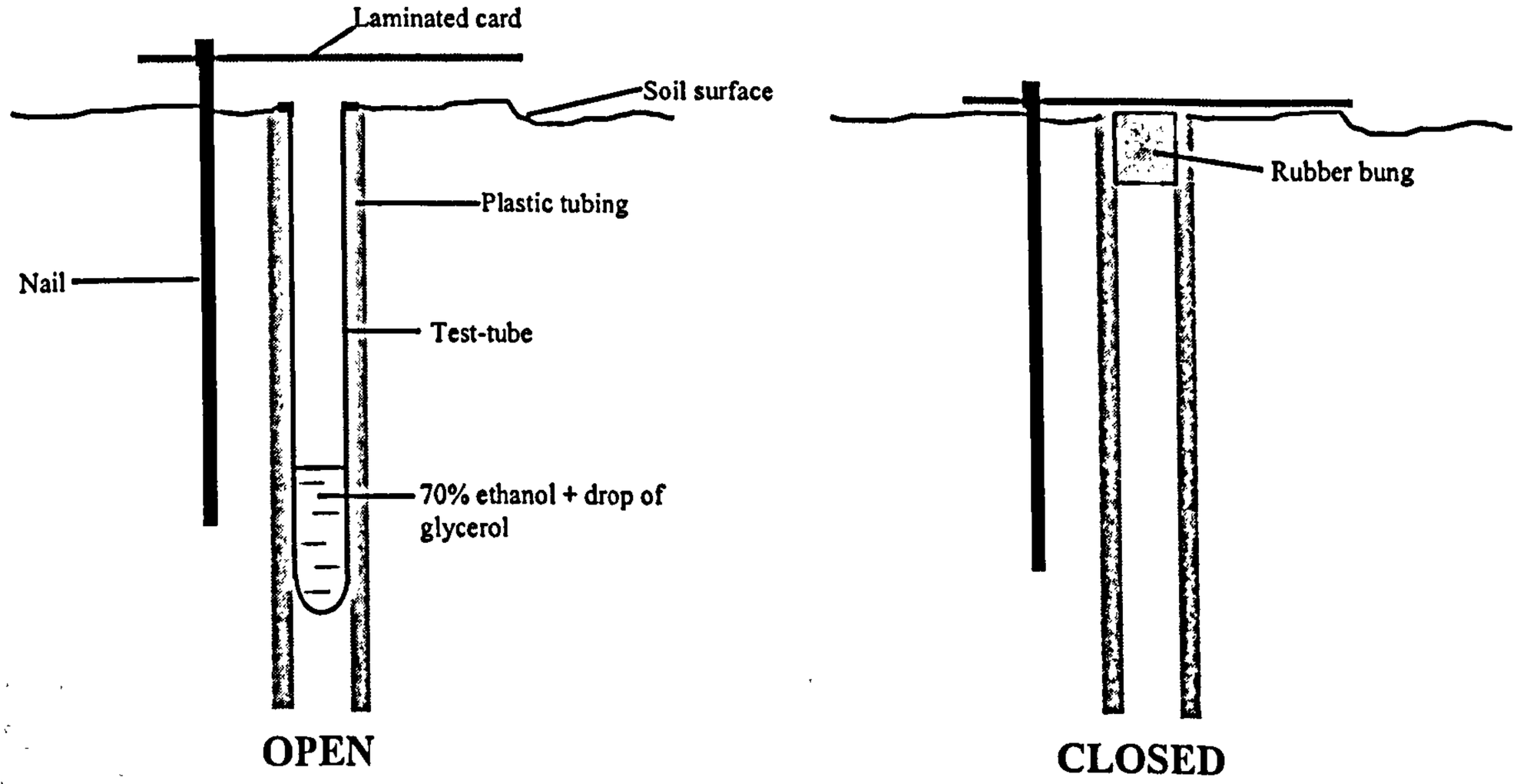
6.1 Introduction

The changes in the distribution of other invertebrates caught in pitfall traps across the foraging area of a *Formica rufa* nest are experimentally investigated to determine the how the distribution of *F. rufa* affects the distribution of other ground living invertebrates.

6.2 Method

The pitfall trap method used was a modified version of Samways' (1983) technique (Figure 6.1). A trap consisted of a 18 mm x 150 mm test tube containing 4 cm of 70 % ethanol and a drop of glycerol inside a length of plastic tubing sunk into the ground. A laminated card trap number was fixed in the ground with a 15 cm long nail which also served as a rain shelter. When not in use the plastic tube was closed with a rubber bung and the trap covered by pushing the nail fully into the ground. The small diameter meant only invertebrates were caught.

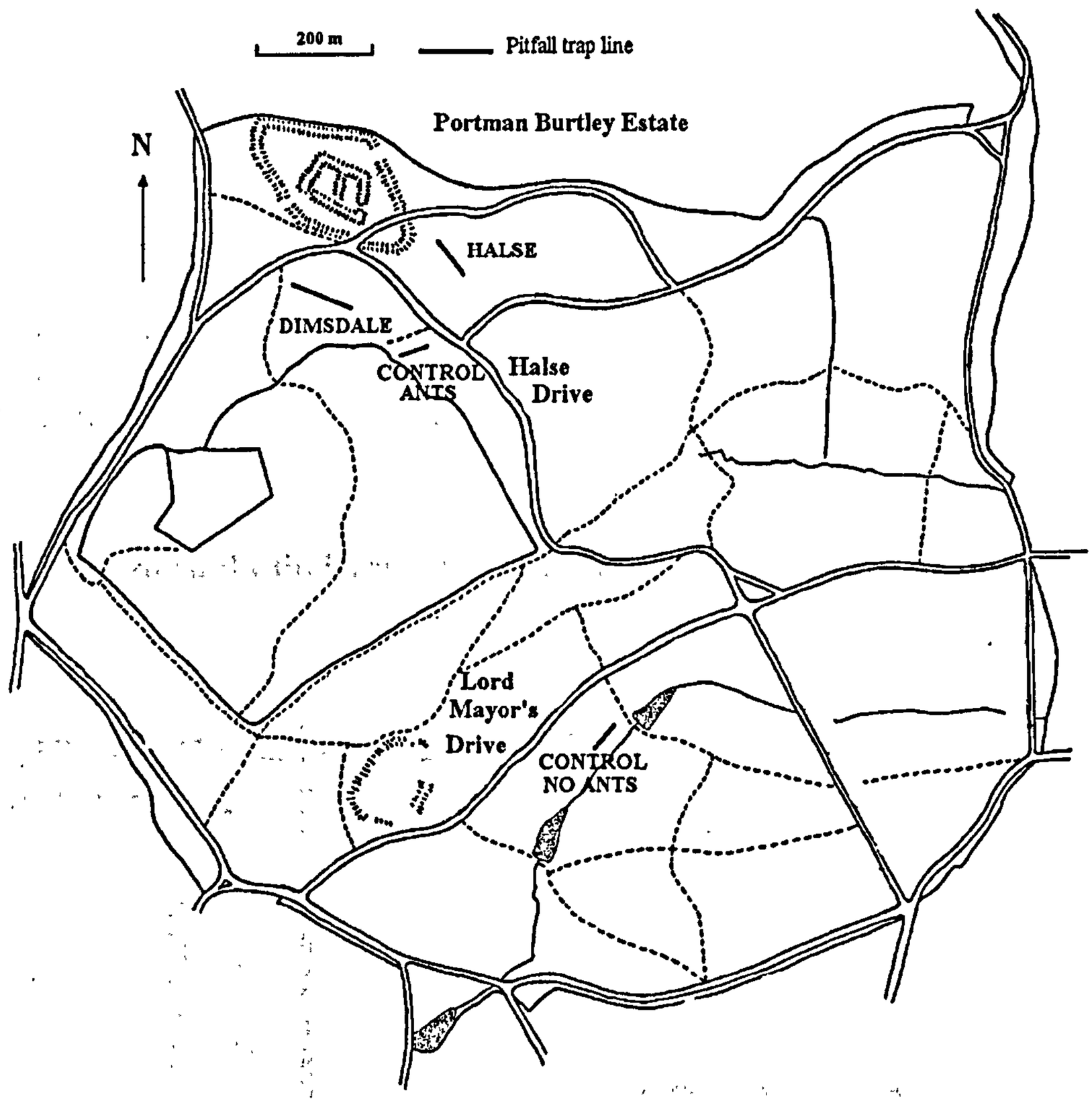
Figure 6.1: Diagram of open and closed pitfall traps



Three trap lines were established between nests (Figure 6.2): one which started 5 m from the nest whose area had been grease banded (9H) and ended 5 m from a nest outside this area (7H) (Halse, 18 traps); one which started at 5 m from the nest which was fed (10D) and ended on the edge of another nest outside this area (2D) (Dimsdale,

24 traps) and one starting and ending 5 m from two nests outside the experimental area (Control ants, 12 traps). There was also one control line in a *F. rufa* free area (Control no ants, 11 traps). Traps were placed at 5 m intervals. Each trap line had a different number of traps, as the distances between nests varied. The trap line at Dimsdale was slightly different to Halse and Control ants because there was an additional nest (6D) situated 2 m from trap 18. A description of the area surrounding each pitfall trap is shown in Appendix J.

Figure 6.2: Location of pitfall trap lines in Burnham Beeches



The sampling dates are shown in Table 1.1. The length of time the traps were opened for during the year depended on the air temperature. Winter samples meant traps had to be opened longer, as there were fewer active invertebrates whilst summer traps caught many *F. rufa*. Traps were checked daily and contents emptied as necessary into glass specimen tubes (75 mm by 25 mm), filled with 70 % ethanol for storage.

Table 6.1: Sample dates for pitfall trapping

Date	Time open /24 hour periods
23/11/94 to 30/11/94	7
11/01/95 to 18/01/95	7
05/04/95 to 10/04/95	5
15/05/95 to 19/05/95	4
10/07/95 to 14/07/95	4
28/08/95 to 01/09/95	4
08/11/95 to 14/11/95	6
11/02/96 to 21/02/96	10
02/04/96 to 08/04/96	5
23/06/96 to 26/06/96	3

6.3 Results

All invertebrates caught in the traps were counted. The data from different days' catches were pooled for each trap and a mean count per day calculated for comparison. The mean catch per trap per day for each site (Dimsdale, Halse, Control ants and Control no ants) on each of the ten sampling periods are shown in Appendices K to N. The two ant species present, *F. rufa* and *Myrmica ruginodis*, were identified to species as was the staphylinid beetle, *Zyras humeralis*. The remaining invertebrates were not identified to species level but to family level where possible[1]. No invertebrates with a body length less than 50 μm were counted or identified.

Due to the low numbers trapped for most individual families, data were initially pooled into two broad categories based on feeding habit, namely predatory or non-predatory (Appendix O). Since a negative correlation is expected between *F. rufa* and other predators, the predatory group was examined in more detail and numbers in two smaller groups, the Arachnida and the predatory Coleoptera, were recorded separately. Scavengers were included in the predatory group, for example Opiliones and *M. ruginodis*. Numbers of Acari have not been used because the order has a wide range of feeding types and it was not possible to identify them to family. Table 6.2 shows the taxonomic groupings of the predatory invertebrates. Numbers in all unidentified families were not included.

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[1] *Formica rufa* and *Zyras humeralis* were counted by the author. The rest of the invertebrates were identified to family and counted by Derek Harvey and Mike Cammell.

Table 6.2: Different groups of predatory invertebrates

Arachnida (excluding Acari)	Predatory Coleoptera (excluding *Zyras humeralis*)	All predators (excluding Acari)
Araneae	Coleoptera: Carabidae	Arachnida (excluding Acari)
Opiliones	Coleoptera: Staphylinidae (excluding *Zyras humeralis*)	Predatory Coleoptera (excluding *Zyras humeralis*)
Pseudoscorpionida	Coleoptera: Coccinellidae	Chilopoda
	Coleoptera: larvae	Hemiptera: Nabidae
		Hemiptera: Reduviidae
		Diptera: Empididae
		Diptera: Dolichopodidae
		Diptera: Asilidae
		Hymenoptera: Vespidae
		Hymenoptera: *Myrmica ruginodis*
		Coleoptera: *Zyras humeralis*

6.3.1 Seasonal profile of different invertebrate groups

Dipterous adults were trapped in large numbers and this may suggest that the trap was attractive in some chemical way as a ground level pitfall trap would not be expected to trap flying insects. Thus, Drosophilidae (fruit flies) are likely to have been attracted to the trap by the alcohol. The adults of the family Trichoceridae (winter gnats) commonly dance in swarms during the winter (Imms 1970). They were trapped in all sites but only during January 1995, November 1995 and February 1996. A few individuals were trapped in April 1996 which was a very cold month (Figures 3.7 and 3.8).

Aphididae were recorded in traps only from sites where *F. rufa* was present. All the specimens were identified as *Lachnus roboris*. The highest numbers trapped were in May 1995, the time when peak abundance of *L. roboris* occurred (Figure 5.6). During May, apterous individuals of *L. roboris* sometimes disperse and are taken as prey by *F. rufa* (section 5.5.3).

The seasonal profile of invertebrate catches per trap per day for all predators and all non-predators in relation to *F. rufa* is shown in Figure 6.3 to Figure 6.6. The seasonal activity of *F. rufa* is very similar at the three sites where *F. rufa* is present. Numbers trapped per day in January 1995 and February 1996 were very small, reaching a maximum of 0.57 in January 1995 and 0.40 in February 1996 for Control ants (Appendix M). Mean numbers caught per trap per day in April 1995 were higher compared with April 1996 which was colder, for example, Halse for April 1995 the mean per day was 98.1 and in April 1996 it was 13.1. Mean numbers reached a peak in July and August 1995. The maximum mean number per trap per day was 227.6 recorded at Dimsdale in August 1995. Mean numbers of *F. rufa* trapped in November 1994 and 1995 dropped rapidly as winter approached, all mean numbers per trap per day

were less than 16. In Dimsdale, Halse and Control ants, *F. rufa* were trapped in very large numbers, as much as 1000 times the numbers of other invertebrates, for example the mean number of Reduviidae and Mycetophilidae caught per trap per day at Dimsdale in July 1995 was 0.02, and for *F. rufa*, 207.7 (Appendix K). Differences between sites are investigated in section 6.3.2.

Collembola were one of the most abundant groups in terms of numbers trapped (Figure 6.11 to Figure 6.14). They were trapped in all sites all year round and were most numerous in the Summer months. The high value for the mean catch per trap per day for non-predators in May 1995 (3.90 invertebrates per trap per day) for Dimsdale and July 1995 for Control ants (4.21 invertebrates per trap per day) was due to the large numbers of Collembola trapped (2.67 and 2.17 per trap per day respectively). The peak in predators in May 1995 (1.50 invertebrates per trap per day) at the Control no ants site was due to high numbers of Carabidae (0.84 per trap per day) and for non-predators (1.47 invertebrates per trap per day), the peak was due to the numbers of Collembola (0.66 per trap per day).

The seasonal profile of catches per trap per day for different groups of predators is shown for the four trap sites in Figure 6.7 to Figure 6.10. Although the invertebrates were not identified to species, observation of the individuals trapped showed that *F. rufa* does influence the species composition. The Arachnida group was dominated by the numbers of Opiliones caught (Table 6.3). In the predatory Coleoptera group, the *F. rufa* present sites had mainly Staphylinidae and the *F. rufa* free site mainly Carabidae (Table 6.4). The individual Carabidae trapped at Control no ants were different, larger species than those trapped at the *F. rufa* present sites (*pers. obs.*). Differences between sites are investigated in section 6.3.2.

The seasonal profile of catches per trap per day for *Z. humeralis* and *F. rufa* is shown for the four trapping sites in Figure 6.15 to Figure 6.17. The abundance of *Z. humeralis* followed the same pattern as that of *F. rufa*; *Z. humeralis* was only trapped when *F. rufa* was active. No *F. rufa* or *Z. humeralis* were recorded from the Control no ants area.

Figure 6.3: Seasonal variation in mean catch per trap per day of different invertebrate groups at Dimsdale 1994 to 1996

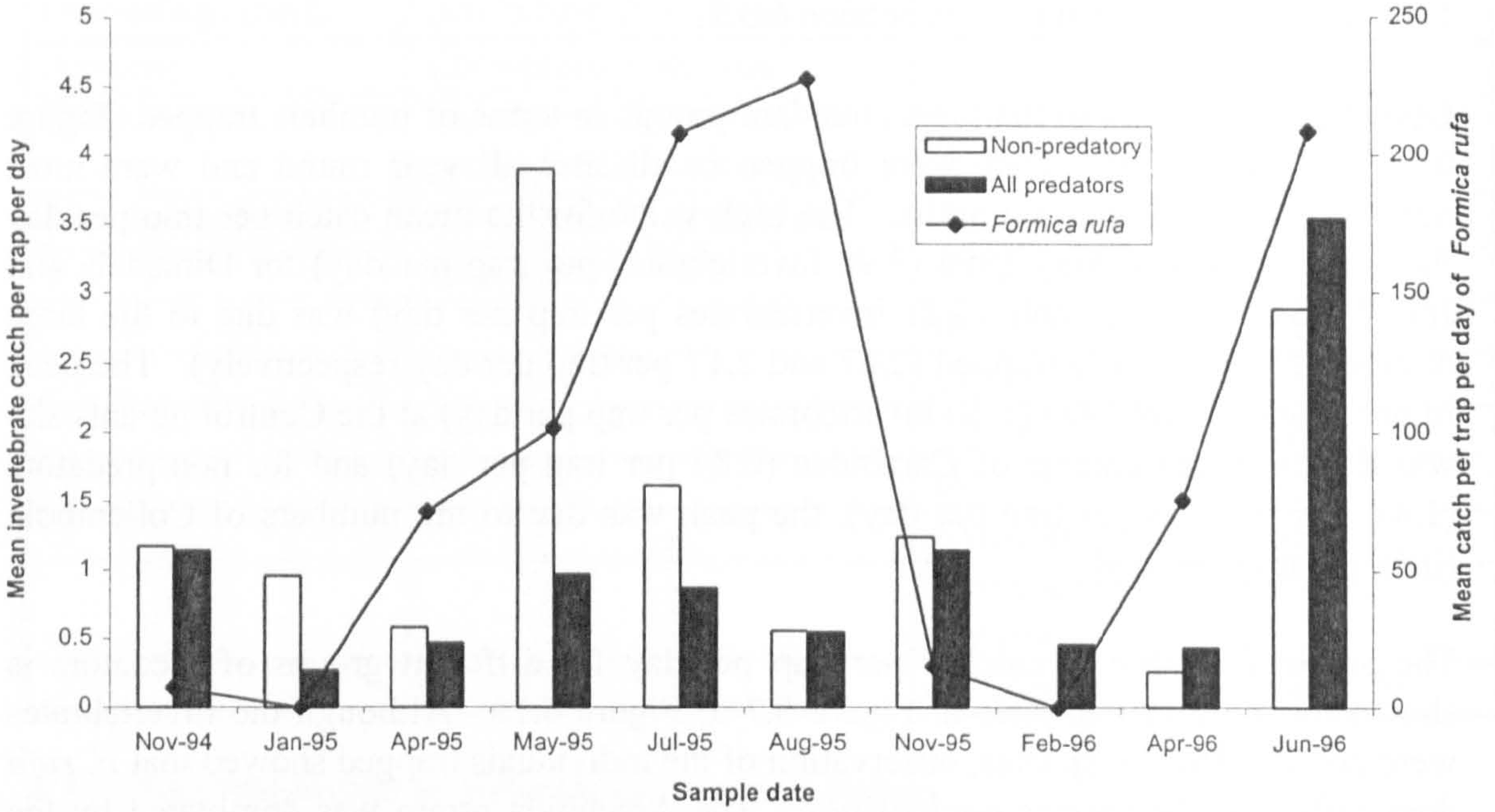


Figure 6.4: Seasonal variation in mean catch per trap per day of different invertebrate groups at Halse 1994 to 1996

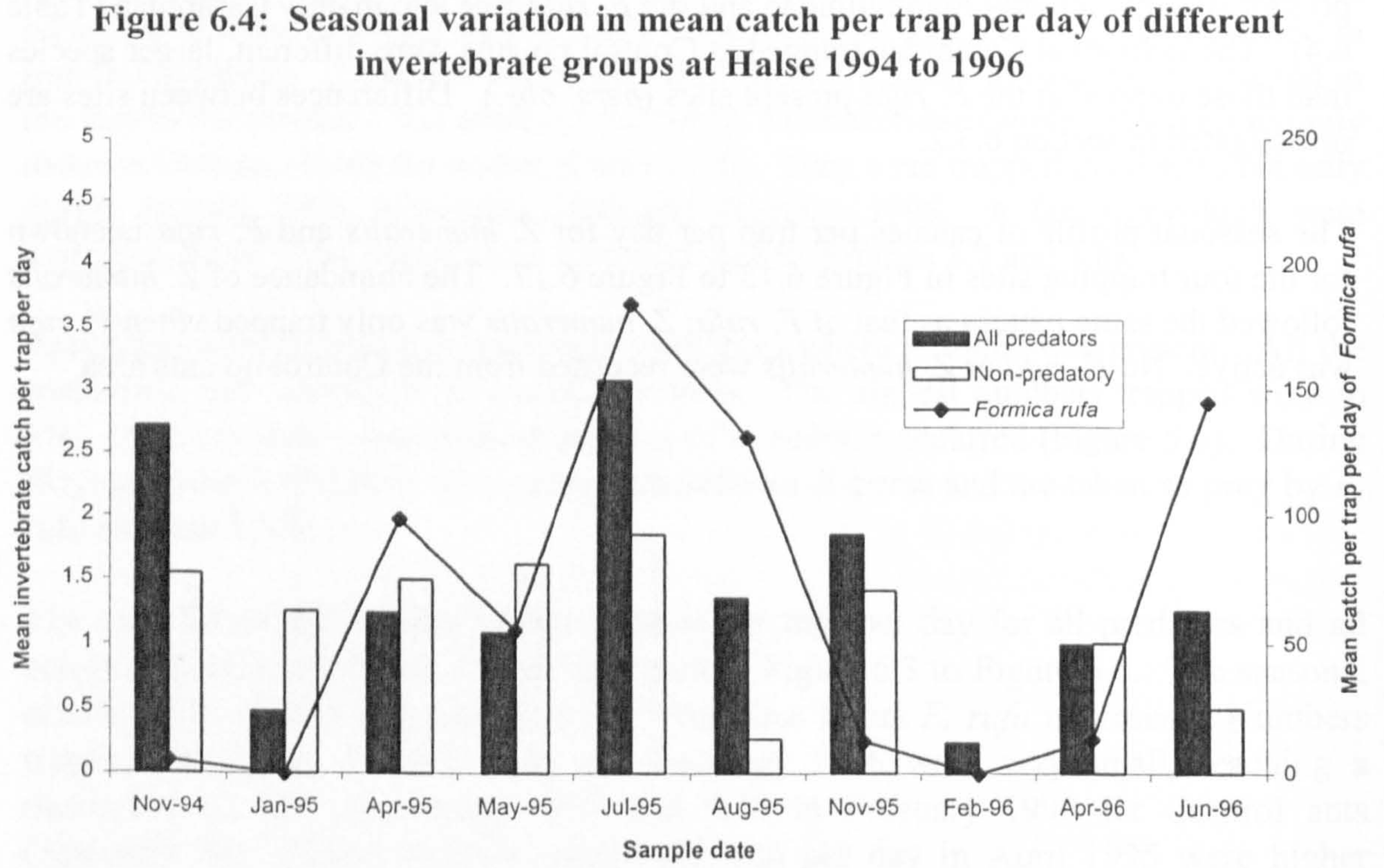


Figure 6.5: Seasonal variation in mean catch per trap per day of different invertebrate groups at Control ants 1994 to 1996

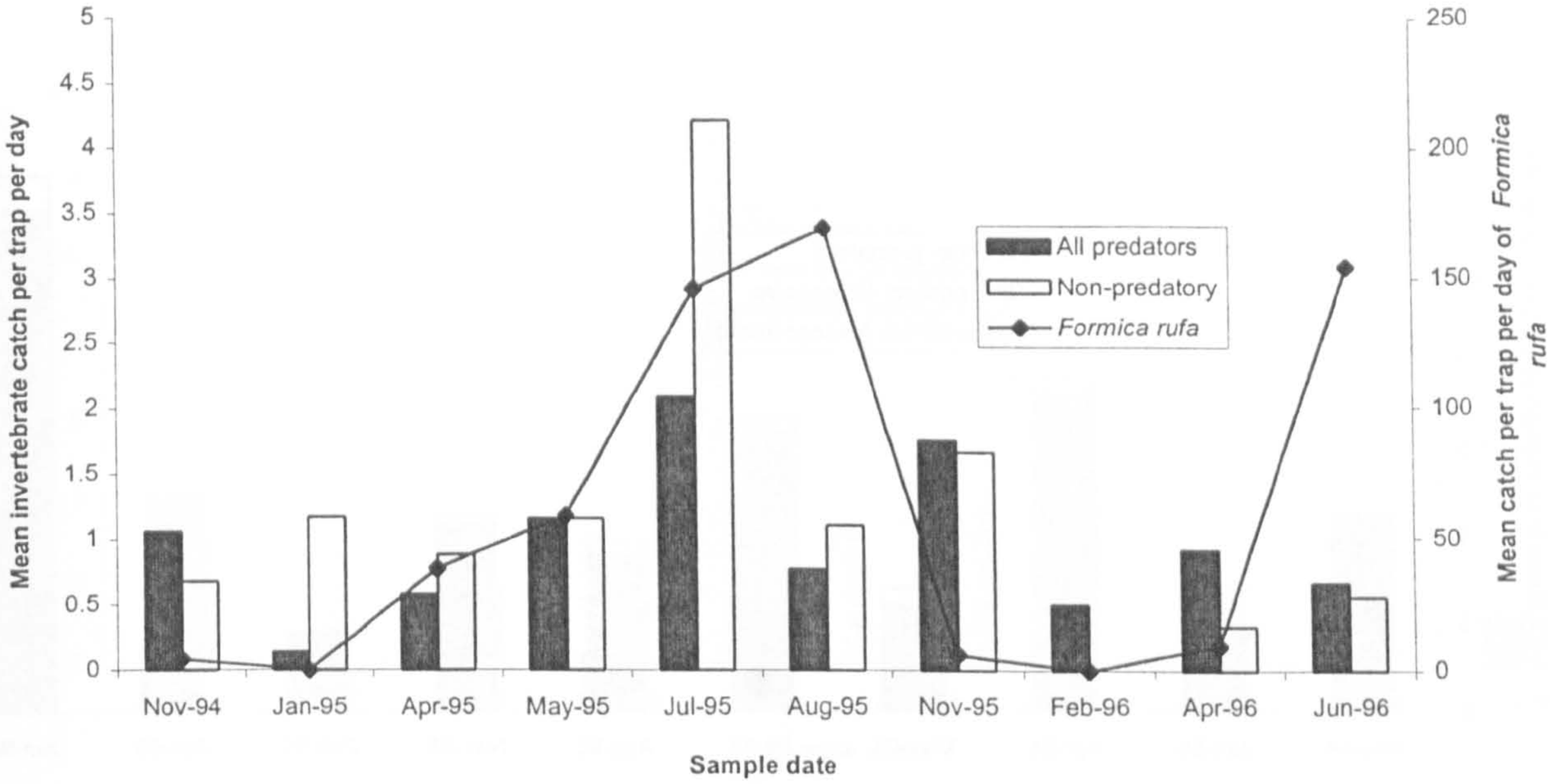


Figure 6.6: Seasonal variation in mean catch per trap per day of different invertebrate groups at Control no ants 1994 to 1996

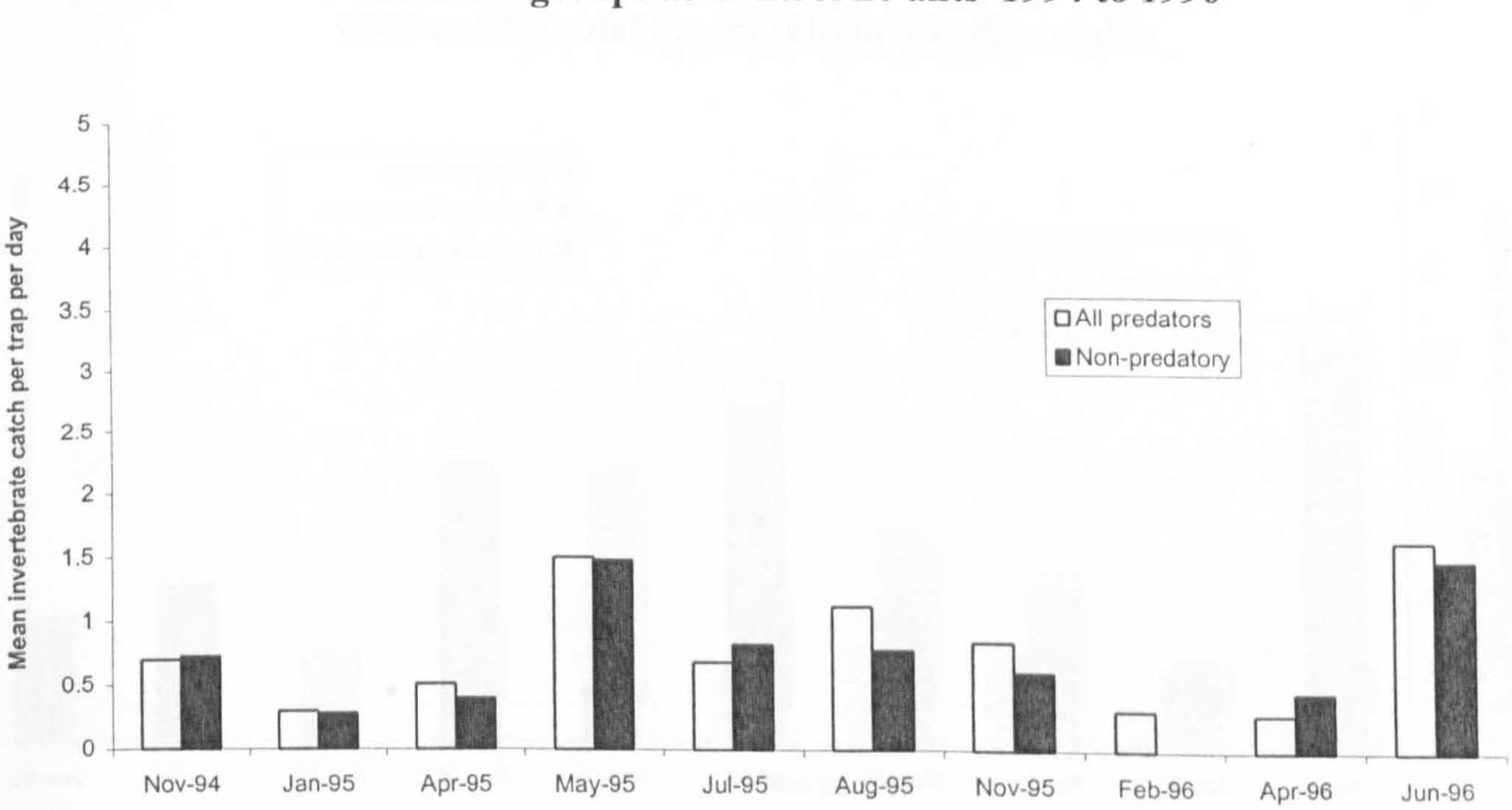


Figure 6.7: Seasonal variation in mean catch per trap per day of different groups of invertebrate predators at Dimsdale 1994 to 1996

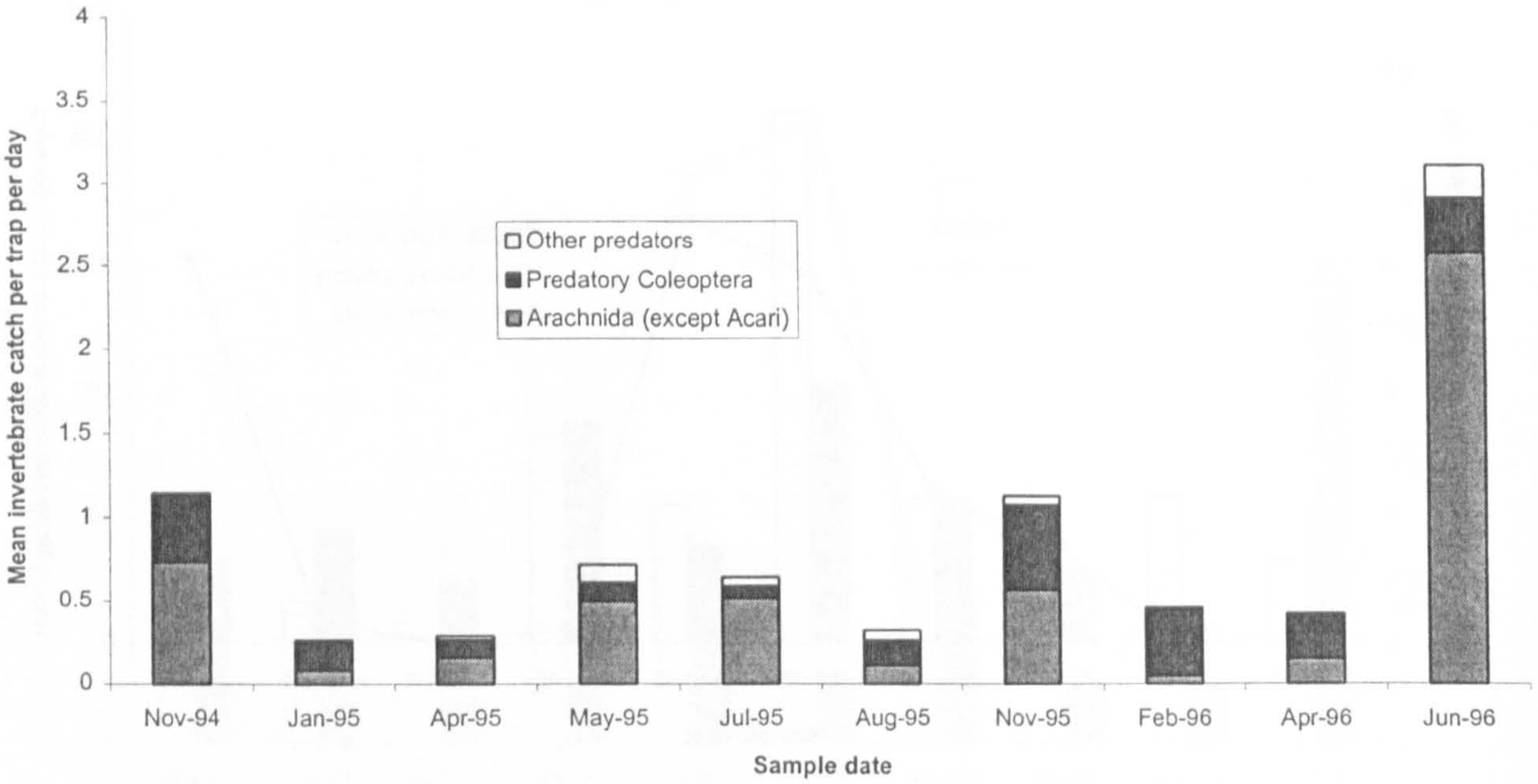


Figure 6.8: Seasonal variation in mean catch per trap per day of different groups of invertebrate predators at Halse 1994 to 1996

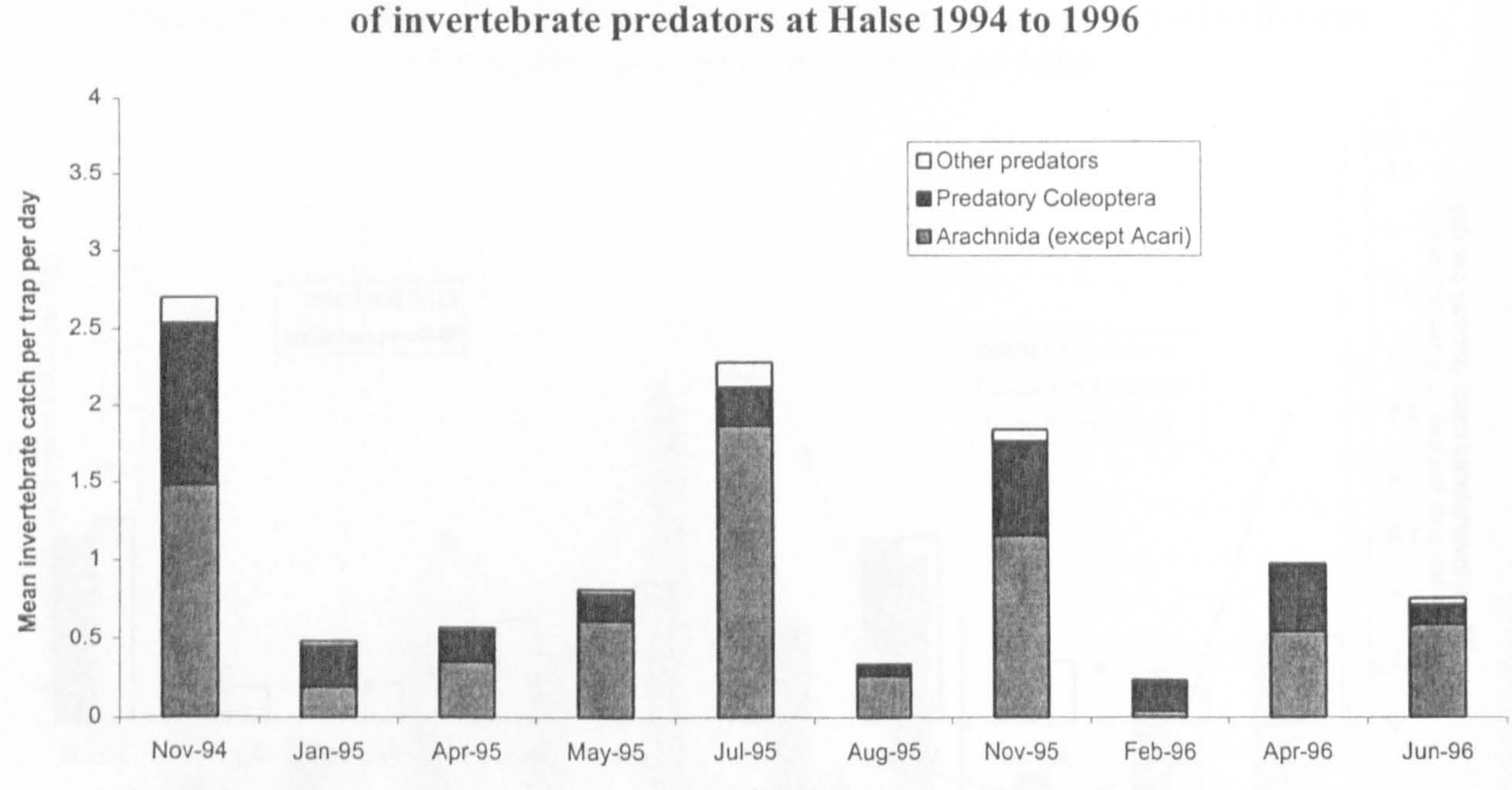


Figure 6.9: Seasonal variation in mean catch per trap per day of different groups of invertebrate predators at Control ants 1994 to 1996

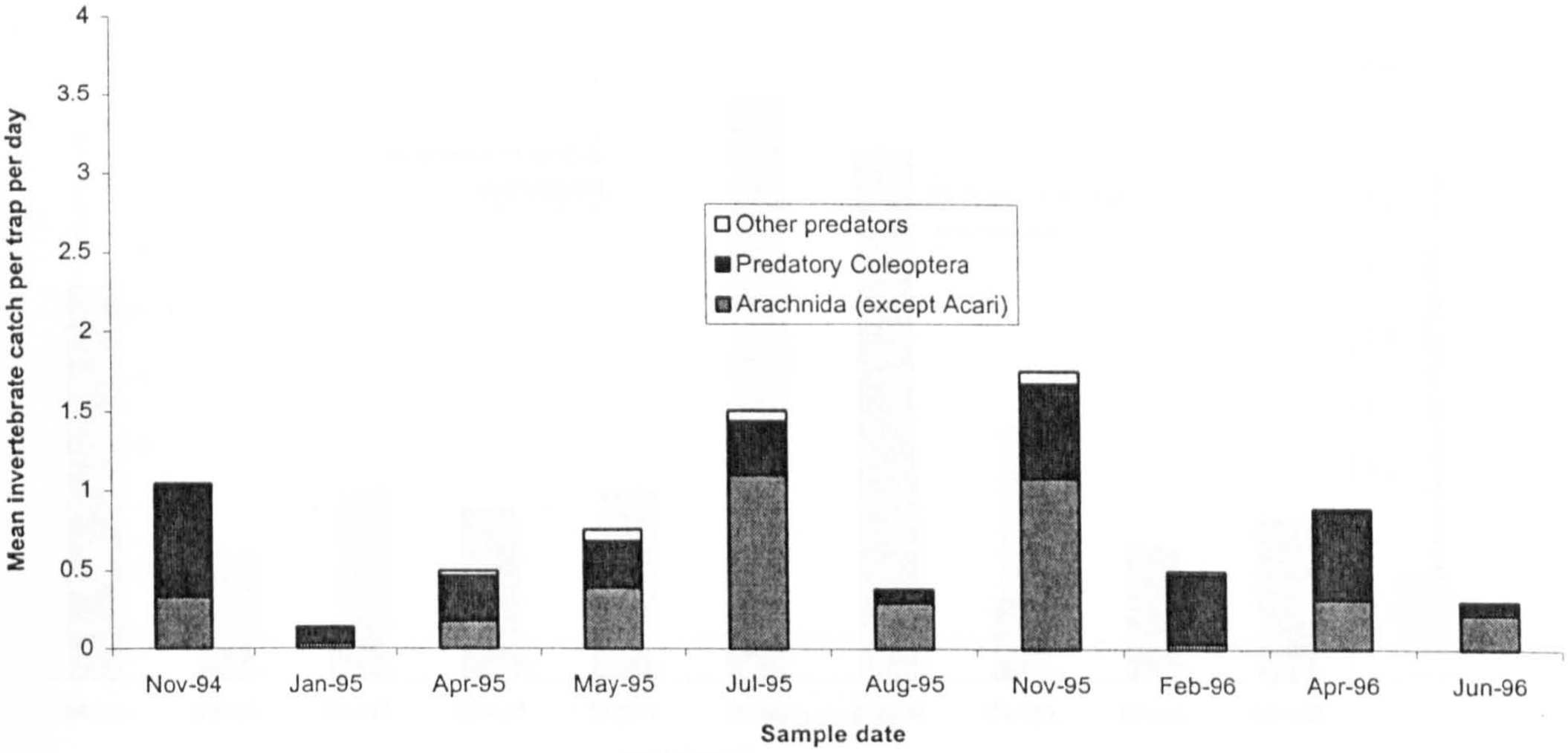


Figure 6.10: Seasonal variation in mean catch per trap per day of different groups of invertebrate predators at Control no ants 1994 to 1996

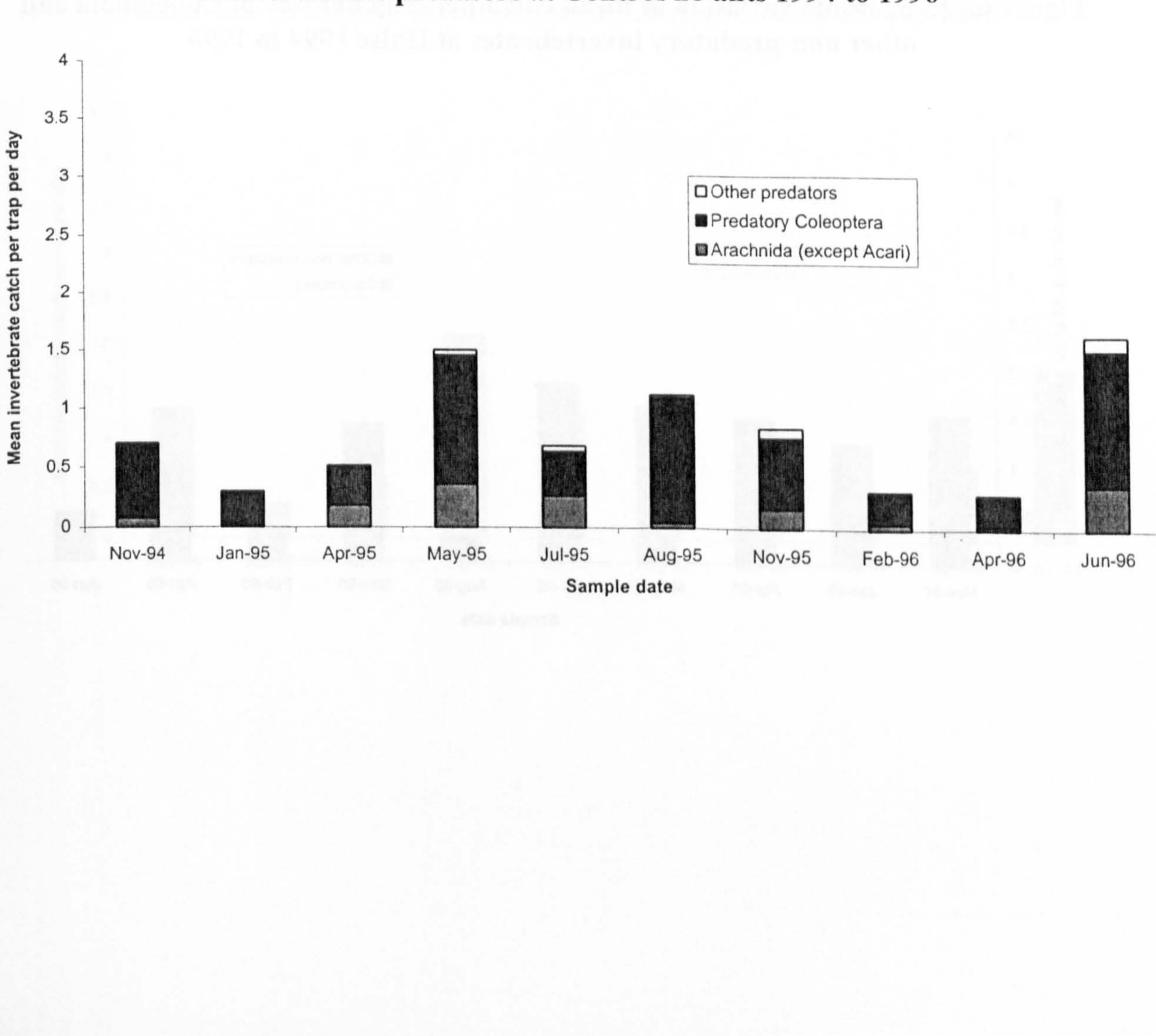


Figure 6.11: Seasonal variation in mean catch per trap per day of Collembola and other non-predatory invertebrates at Dimsdale 1994 to 1996

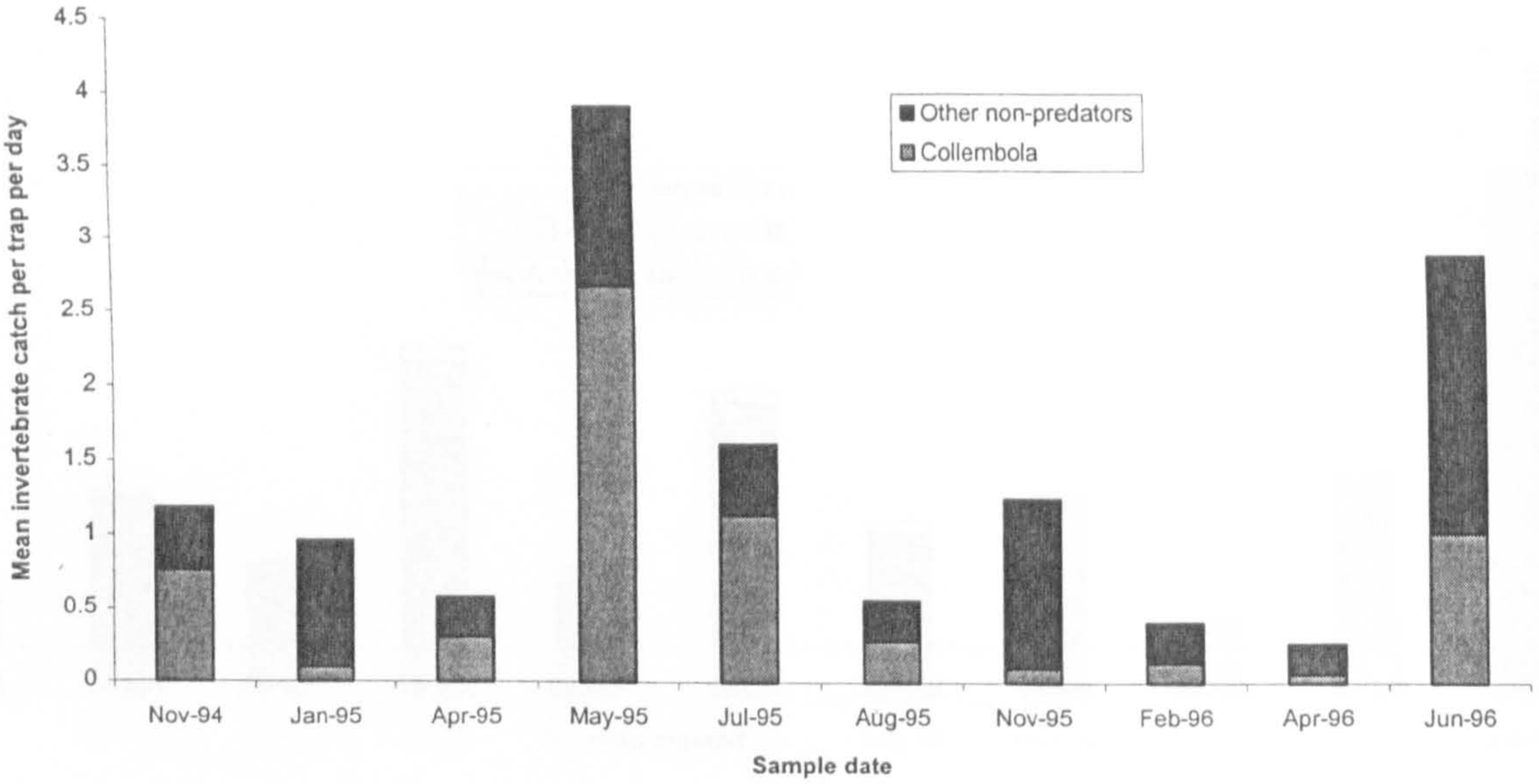


Figure 6.12: Seasonal variation in mean catch per trap per day of Collembola and other non-predatory invertebrates at Halse 1994 to 1996

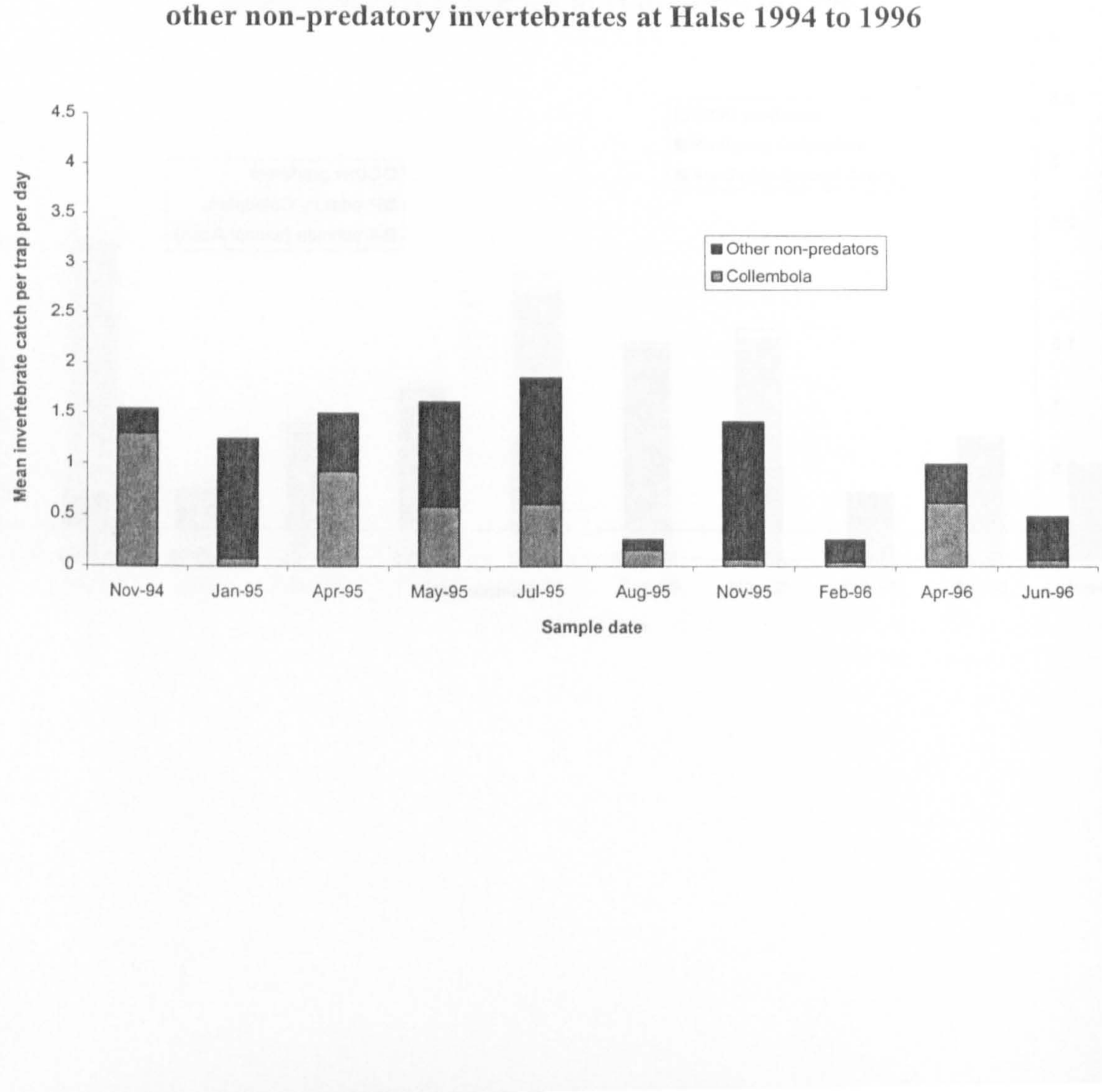


Figure 6.13: Seasonal variation in mean catch per trap per day of Collembola and other non-predatory invertebrates at Control ants 1994 to 1996

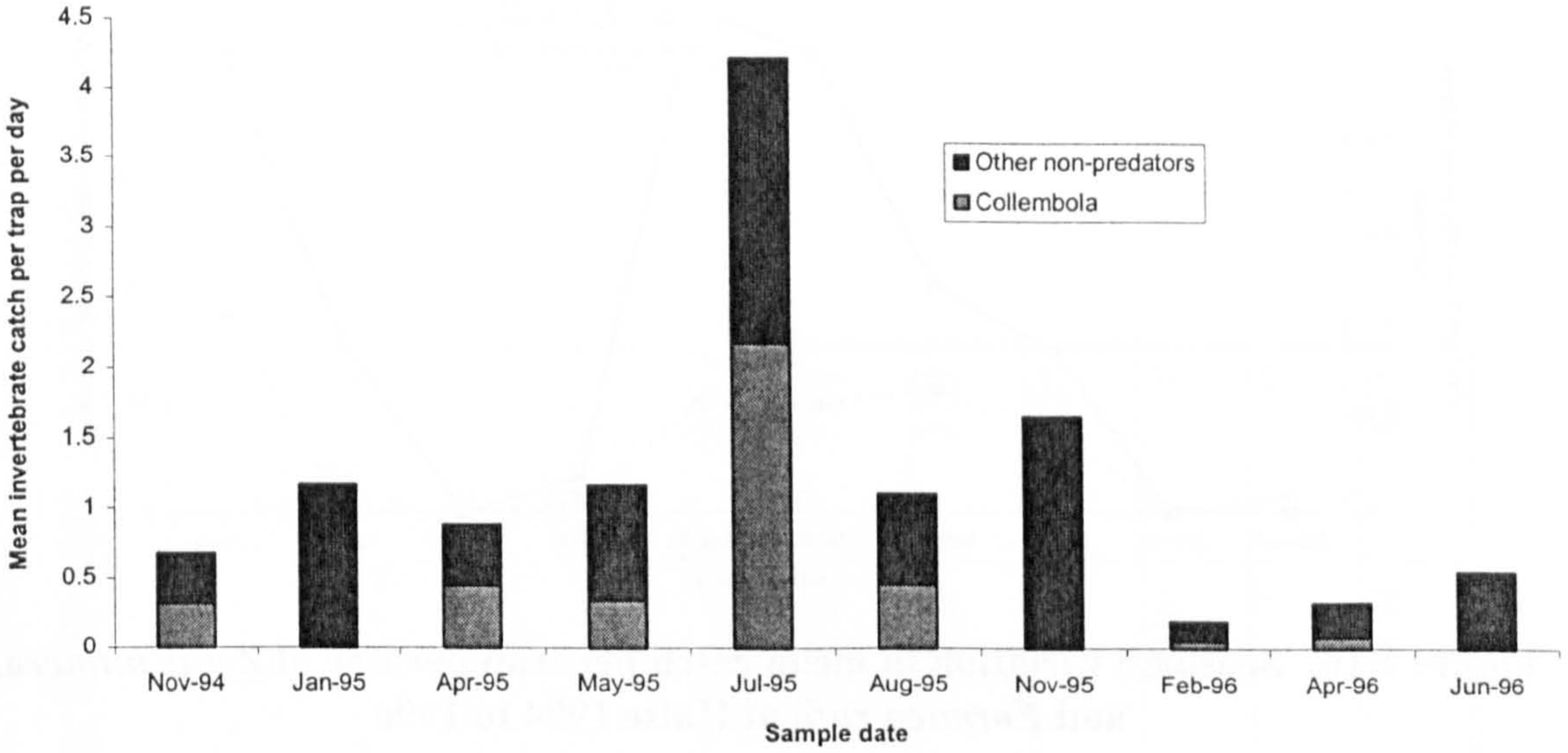


Figure 6.14: Seasonal variation in mean catch per trap per day of Collembola and other non-predatory invertebrates at Control no ants 1994 to 1996

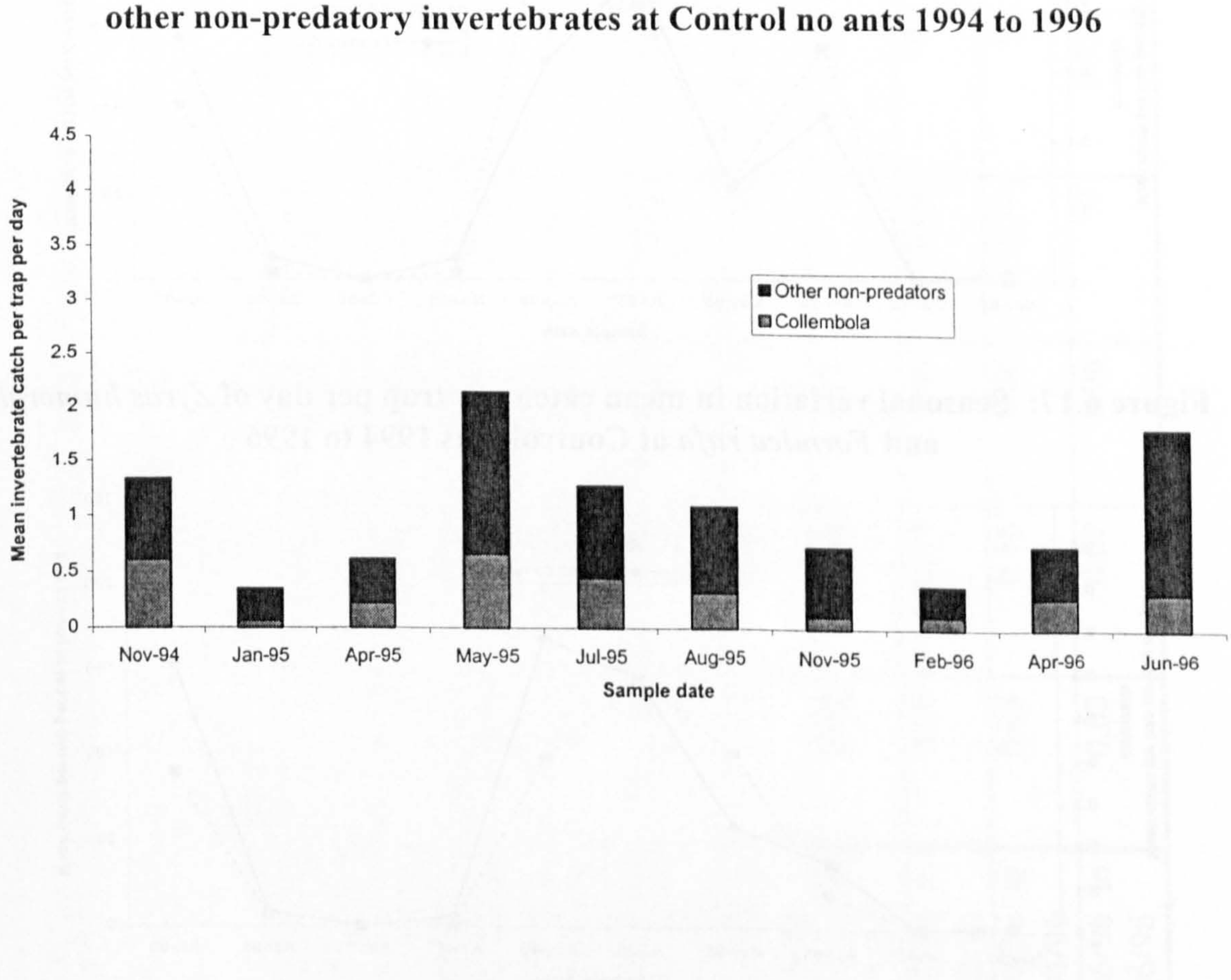


Figure 6.15: Seasonal variation in mean catch per trap per day of *Zyras humeralis* and *Formica rufa* at Dimsdale 1994 to 1996

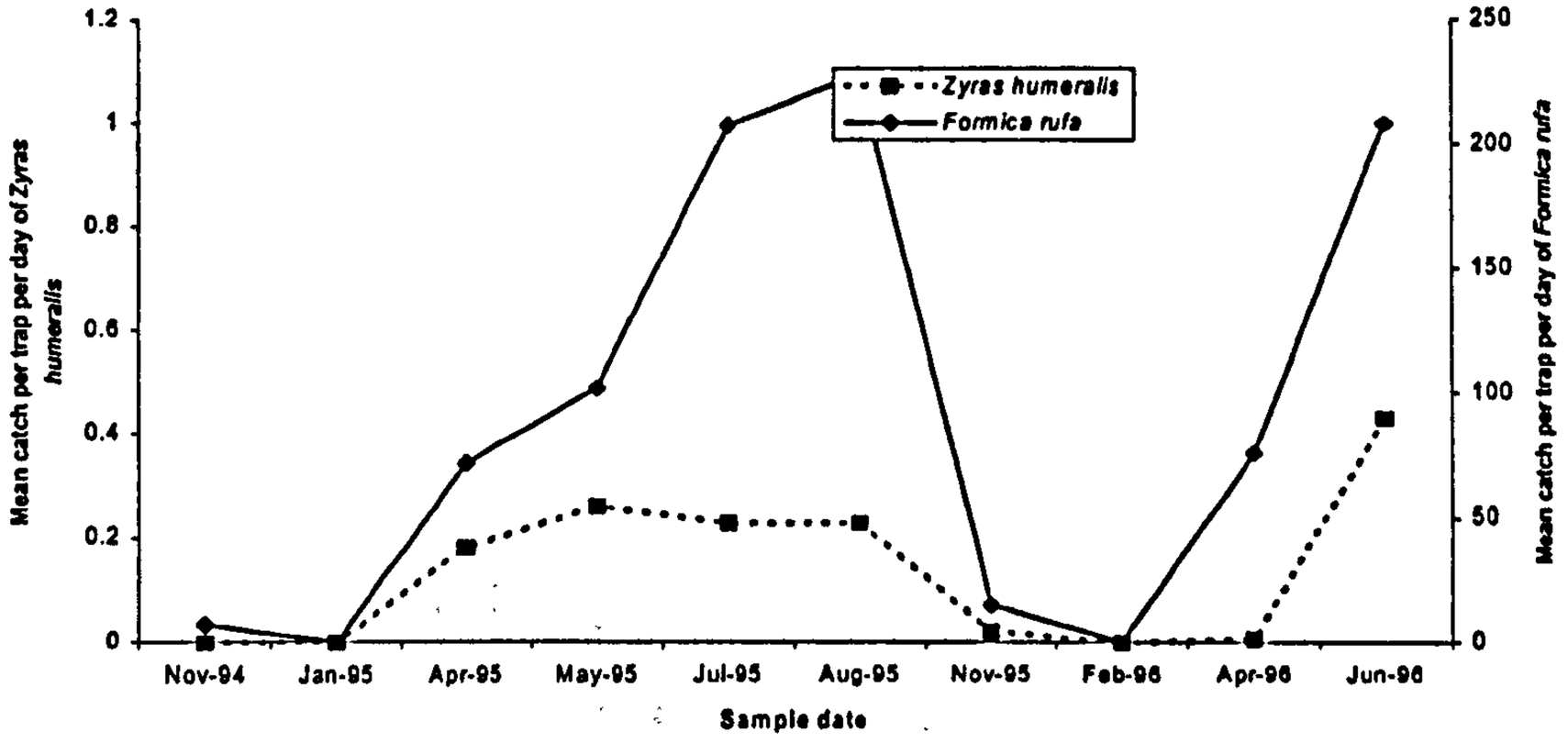


Figure 6.16: Seasonal variation in mean catch per trap per day of *Zyras humeralis* and *Formica rufa* at Halse 1994 to 1996

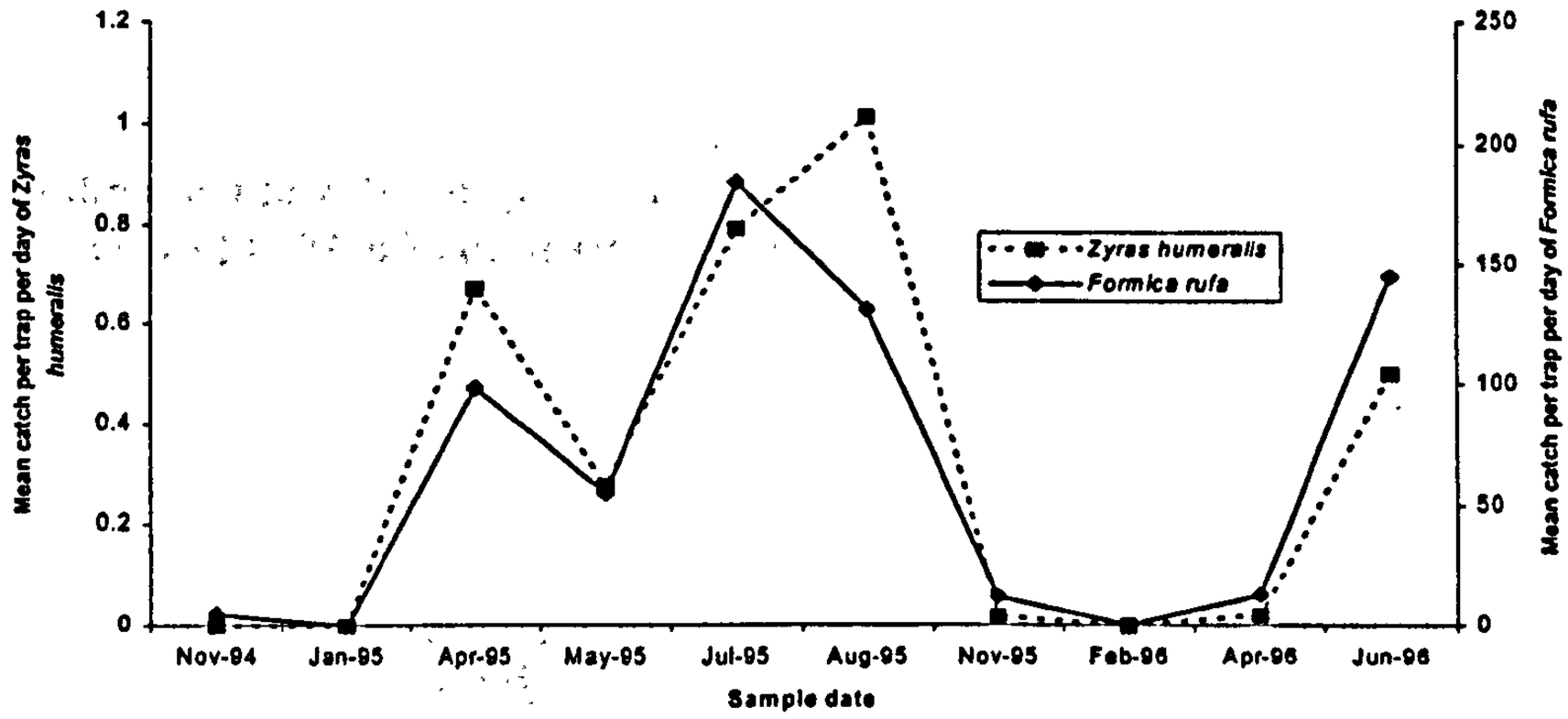


Figure 6.17: Seasonal variation in mean catch per trap per day of *Zyras humeralis* and *Formica rufa* at Control ants 1994 to 1996

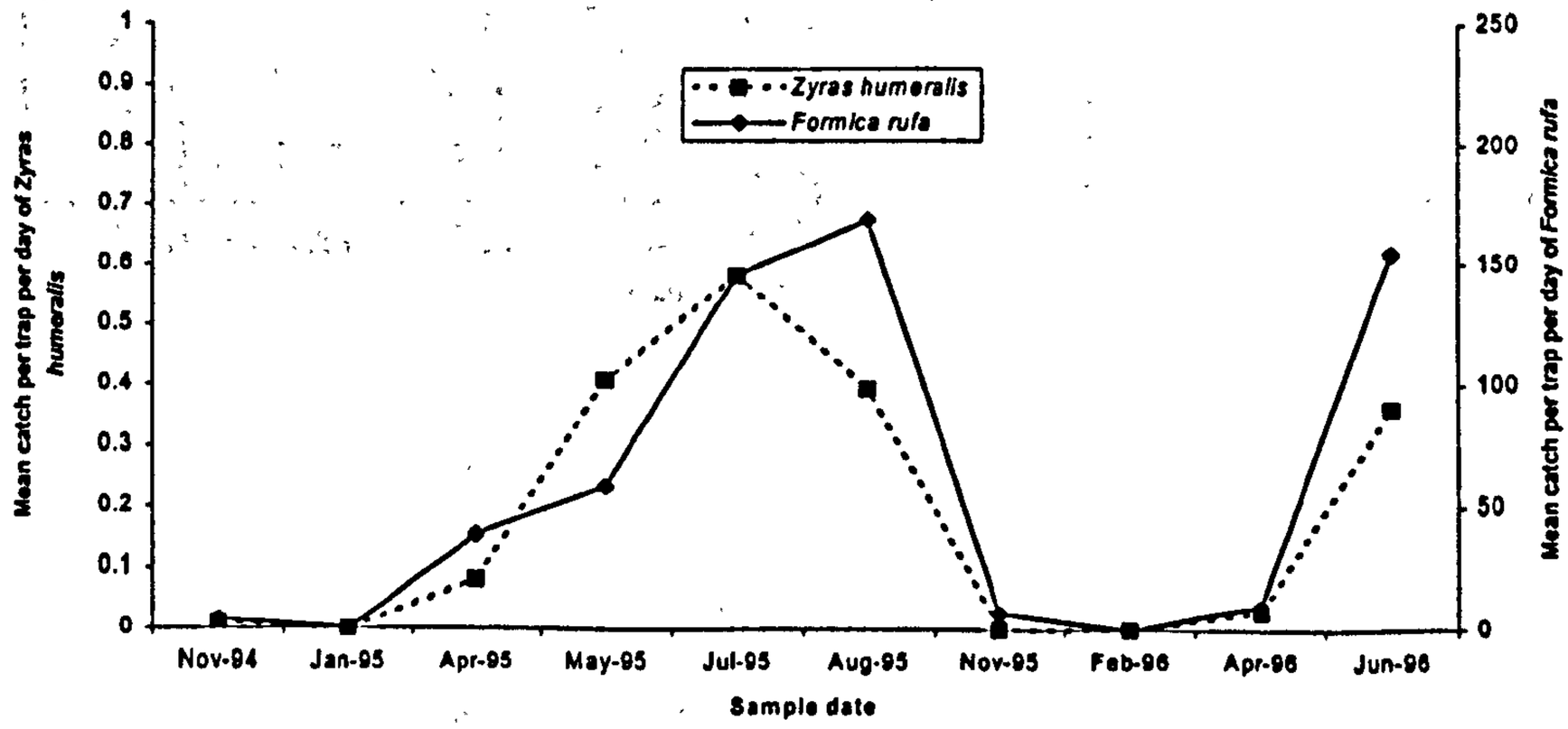


Table 6.3: Seasonal variation in mean invertebrate catch per trap per sample date for Araneae and Opiliones

	Araneae				Opiliones			
	Control no ants	Dimsdale	Halse	Control ants	Control no ants	Dimsdale	Halse	Control ants
23/11/94 to 30/11/94	0	0.06	0.03	0.01	0.08	0.68	1.42	0.32
11/01/95 to 18/01/95	0.02	0.01	0.02	0.04	0	0.07	0.17	0
05/04/95 to 10/04/95	0.15	0.16	0.34	0.13	0.04	0	0.01	0.05
15/05/95 to 19/05/95	0.16	0.10	0.15	0.07	1.30	0.40	0.46	0.32
10/07/95 to 14/07/95	0.07	0.08	0.08	0.06	0.21	0.43	1.78	1.04
28/08/95 to 01/09/95	0	0.04	0	0	0.05	0.07	0.26	0.29
08/11/95 to 14/11/95	0.02	0.02	0.05	0	0.15	0.56	1.11	1.08
11/02/96 to 21/02/96	0.05	0.04	0.04	0.04	0	0.01	0.07	0
02/04/96 to 08/04/96	0.03	0.16	0.54	0.31	0	0	0	0
23/06/96 to 26/06/96	0.03	0.07	0.06	0	0.33	2.49	0.54	0.22

Table 6.4: Seasonal variation in mean invertebrate catch per trap per sample date for Carabidae, Staphylinidae (excluding *Zyras humeralis*) and *Zyras humeralis*

	Carabidae				Staphylinidae				*Zyras humeralis*			
	Control no ants	Dimsdale	Halse	Control ants	Control no ants	Dimsdale	Halse	Control ants	Control no ants	Dimsdale	Halse	Control ants
23/11/94 to 30/11/94	0.18	0.02	0.02	0.02	0.30	0.35	0.90	0.62	0	0	0	0.01
11/01/95 to 18/01/95	0	0	0	0	0.14	0.14	0.20	0.11	0	0	0	0
05/04/95 to 10/04/95	0.04	0	0.01	0.02	0.20	0.11	0.15	0.25	0	0.18	0.67	0.08
15/05/95 to 19/05/95	0.84	0.01	0	0	0.23	0.07	0.14	0.30	0	0.20	0.28	0.41
10/07/95 to 14/07/95	0.21	0	0	0	0.11	0.06	0.17	0.25	0	0.23	0.79	0.58
28/08/95 to 01/09/95	0.75	0	0	0	0.30	0.14	0.06	0.08	0	0.23	1.01	0.40
08/11/95 to 14/11/95	0.17	0	0	0	0.35	0.51	0.60	0.58	0	0.02	0.02	0
11/02/96 to 21/02/96	0	0	0	0	0.11	0.35	0.19	0.41	0	0	0	0
02/04/96 to 08/04/96	0	0.04	0.01	0.01	0.11	0.22	0.41	0.51	0	0.01	0.02	0.03
23/06/96 to 26/06/96	0.09	0	0	0	0.97	0.18	0.09	0.08	0	0.43	0.50	0.36

6.3.2 Differences in invertebrates between sites

The Kruskal-Wallis one way analysis of variance by ranks was used to analyse site differences between samples of different invertebrate groups. A nonparametric measure was used as no assumption about the shape of the distribution had to be made (Siegel 1956). There were ten observations (the mean catch per day for each sampling date) in four samples (four sites; Dimsdale, Halse, Control ants and Control no ants). The results show that there are significant differences between the sites for the Arachnida group (Kruskal-Wallis = 8.3, $p<0.05$) (Table 6.5).

The significant differences highlighted by the Kruskal-Wallis test were further investigated using a Mann-Whitney *U* test for site against site. A nonparametric measure was used as no assumption about the shape of the distribution had to be made (Siegel 1956). Although the predatory Coleoptera group was not significant at the 5 % level, it was significant at the 10 % level, therefore this group was also investigated further using a Mann-Whitney *U* test. The ten observations were the same as for the Kruskal-Wallis test. Each of the four sites was analysed against the other sites. In the Kruskal-Wallis test, the mean rank value most different to the other three was always the value for the Control no ants site. The results of the Mann-Whitney *U* test confirm that the significant differences highlighted in the Kruskal-Wallis tests were all due to differences between the *F. rufa* free site (Control no ants) and the *F. rufa* present sites (Dimsdale, Halse and Control ants) (Table 6.6 and Table 6.7). The Control no ants Arachnida group was significantly different to the Halse Arachnida group (U=16.0, $p<0.05$). For the Dimsdale and Control ants Arachnida groups, the results were not significant at the 5 % level, but they were significant at the 10 % level. The Control no ants predatory Coleoptera group was significantly different to the Halse and Dimsdale predatory Coleoptera groups (U=20.0, $p<0.05$ and U=21.0, $p<0.05$).

Table 6.5: Kruskal-Wallis test for differences between sites for different invertebrate groups

* Significant at 0.05, ns = not significant.

	Arachnida (excluding Acari)	Predatory Coleoptera (excluding *Zyras humeralis*)	Other predators	All predators (excluding Acari)	*Formica rufa*	*Zyras humeralis*	All non-predators	Collembola	Other non-predators
	Mean rank	Mean rank	Mean rank	Mean rank	Mean rank	Mean rank	Mean rank	Mean rank	Mean rank
Control no ants	12.5	28.2	18.5	17.2	--	--	15.9	21.0	22.1
Dimsdale	21.6	16.0	22.4	17.7	17.6	13.7	22.2	23.4	19.5
Halse	27.4	17.4	23.7	26.6	14.6	17.5	23.4	21.3	19.0
Control ants	20.5	20.5	17.5	20.6	14.4	15.3	20.7	16.3	21.5
Kruskal-Wallis	8.3	6.6	2.0	4.1	0.9	1.0	2.4	2.0	0.5
Significance	*	ns	ns	ns	ns	ns	ns	ns	ns

Table 6.6: Mann-Whitney *U* test for differences between sites in Arachnida (excluding Acari)

* Significant at 0.05, ns = not significant.

Arachnida (excluding Acari)	Control no ants			Dimsdale			Halse		
	U	z	Sig.	*U*	z	Sig.	*U*	z	Sig.
Control ants	28.0	-1.7	ns	48.0	-0.2	ns	30.0	-1.5	ns
Halse	16.0	-2.6	*	35.0	-1.1	ns			
Dimsdale	26	-1.8	ns						

Table 6.7: Mann-Whitney *U* test for differences between sites in predatory Coleoptera (excluding *Zyras humeralis*)

* Significant at 0.05, ns = not significant.

Predatory Coleoptera (excluding *Zyras humeralis*)	Control no ants			Dimsdale			Halse		
	U	z	Sig.	*U*	z	Sig.	*U*	z	Sig.
Control ants	32.0	-1.3	ns	39.5	-0.8	ns	43.0	-0.5	ns
Halse	20.0	-2.3	*	44.0	-0.5	ns			
Dimsdale	21.0	-2.2	*						

6.3.3 Relationship between Formica rufa *and other invertebrates*

To investigate the relationship between *F. rufa* and other invertebrates, a chi-square test was performed based on the null hypothesis that there is no association between numbers of invertebrates caught per day and trap position. The analysis determines the significance of the deviation between observed values and expected values, according to the hypothesis. The chi-square test requires that all expected values must be greater than one and no more than 20 % of the cells should have an expected value of less than five (Siegel 1956, p. 46). In order to achieve this requirement for this data set, the data has to be pooled. Numbers of *F. rufa* caught were not included. One sample chi-square tests were performed for All predators (excluding Acari) and All non-predators for each site (Table 6.8). The mean catches per day for individual dates for each trap were pooled.

Table 6.8: Chi-square test for All predators and All non-predators for each study site

* Significant at 0.05, ** significant at 0.01, *** significant at 0.001, ns = not significant

	All predators (excluding Acari)		All non-predators	
	χ^2 statistic	Significance	χ^2 statistic	Significance
Dimsdale	61.1	***	106.6	***
Halse	66.1	***	32.4	*
Control ants	23.2	*	18.1	ns
Control no ants	10.9	ns	15.3	ns

The results show that for Dimsdale and Halse there was a significant difference between the observed values and the expected values i.e. trap position affects the number of invertebrates caught. For Control ants, there was only a significant difference for the All predators group. For Control no ants there was no significant difference. At Control no ants, no significant difference was found i.e. trap position had no effect on the number of invertebrates caught.

At Dimsdale, Halse and Control ants the trap lines run between two *F. rufa* nests, one at each end. Therefore trap position is related to the distribution of *F. rufa*, with generally higher numbers near the nests (Appendices K to M). For the All predators group at Dimsdale, Halse and Control ants, the presence of *F. rufa* could explain the significant difference, since potential competitors may be spatially partitioned to allow coexistence. For the All non-predators group, the results show that the presence of *F. rufa* affects the distribution of other invertebrates to which it has no direct relationship. The results for Control no ants reinforce the view that it is the presence of *F. rufa* which is affecting the distribution of other invertebrates, since no significant differences were found.

There are, however, alternative explanations. The vegetation found around the pitfall traps was not homogeneous, it varies within trap lines and between study sites which is likely to affect the distribution of some invertebrates (Appendix J). For example, Collembola dominates the catch per day for non-predators and are known to be most abundant in areas of high relative humidity such as might be found in association with mossy areas (Imms 1970). Moss was found around eight of the traps at Dimsdale, one at Halse and none at Control ants. It also may not be reasonable to assume that every invertebrate has an equal chance of being caught in every trap. In addition the number of traps at each site varied. Dimsdale had the greatest number (24) and Control no ants the least (11). As the number of traps decreases, it is likely that a lower diversity of invertebrates will be caught and the results are less representative of the invertebrate community.

In order to investigate the relationship between *F. rufa* and other invertebrates in more detail, a number of correlations were performed. For each sampling date for Dimsdale, Halse and Control ants, the mean catch per day for each trap of *F. rufa* was correlated, using Spearman's Rank Correlation, against the mean catch per day of different invertebrate groups. A nonparametric measure was used as no assumption about the shape of the distribution had to be made (Siegel 1956). The results of the correlation are in Table 6.9 for Dimsdale, Table 6.10 for Halse and Table 6.11 for Control ants.

For Dimsdale, there were 24 traps for each sampling date and 240 traps for the pooled data. For the group Arachnida, only November 1995 and June 1996 showed a significant correlation (r=-0.42, $p<0.05$ and r=-0.71, $p<0.01$) with *F. rufa*, although all dates except November 1994 and February 1996 showed negative association. Overall (pooled data) there was no significant correlation between the Arachnida group and *F. rufa* (r=0.09, $p>0.05$). The predatory Coleoptera group (pooled data) showed an overall significant negative correlation (r=-0.41, $p<0.001$) with *F. rufa*. For the all predators' group, only June 1996 showed significant negative correlation (r=-0.79, $p<0.01$). For

the non-significant correlations, all except November 1994 and February 1996 were negative. Overall (pooled data) the all predators' group showed no significant correlation (r=0.01, p>0.05) with *F. rufa*. For the non-predators' group, the results show no pattern, April 1996 shows a significant negative correlation (r=-0.44, p<0.05) with *F. rufa*. For the non significant results, five were negative and four positive. Overall (pooled data), the non-predators' group shows no significant correlation (r=0.06, p>0.05) with *F. rufa*. For the Collembola, overall (pooled data) there was a significant positive correlation (r=0.19, p<0.01). For other non-predators, the overall (pooled data) showed no significant correlation, although April and June 1996 were significantly negatively correlated (r=-0.42, p=<0.05 and r=-0.51, p<0.01). *Z. humeralis* (pooled data) showed overall significant positive correlation (r=0.35, p<0.001) with *F. rufa*. Figure 6.18 shows an example where there is significant spatial partitioning of *F. rufa* and the all predators group. Figure 6.19 shows the non-predators group where there is no spatial partitioning.

For Halse there were 18 traps per sampling date and 180 traps for the pooled data. For the Arachnida group, only July 1995 showed a significant correlation (r=-0.65, p<0.05) with *F. rufa*, although all dates except February 1996 showed negative association. Overall (pooled data), there was no significant correlation between the Arachnida group and *F. rufa* (r=0.05, p>0.05). The predatory Coleoptera group (pooled data) showed an overall significant negative correlation (r=-0.32, p<0.001) with *F. rufa*. For the all predators' group, July 1995, February 1996 and April 1996 showed significant correlations (r=-0.60, p<0.01; r=0.54, p<0.05; r=0.47, p<0.05). For the non significant correlations, all were negative. Overall (pooled data), the all predators' group showed no significant correlation (r=0.12, p>0.05) with *F. rufa*. For the non-predators group, the results show no pattern, July 1995 shows a significant negative correlation (r=-0.58, p<0.05) with *F. rufa*. For the non significant results, five were positive and four negative. Overall (pooled data), the non-predators' group shows no significant correlation (r=-0.03, p>0.05) with *F. rufa*. For Collembola and other non-predators' groups, neither was significantly correlated overall (pooled data) with *F. rufa*. For individual sampling dates there were three significant negative correlations; June 1996 for Collembola (r=-0.51, p=<0.05) and July and November 1995 for other non-predators (r=-0.62, p=<0.01 and r=-0.56, p<0.05). *Z. humeralis* (pooled data) showed overall significant positive correlation (r=0.49, p<0.001) with *F. rufa*.

Table 6.9: Correlation of *Formica rufa* against different invertebrate groups for Dimsdale (24 traps) 1994 to 1996

* Significant at 0.05, ** significant at 0.01, *** significant at 0.001, ns = not significant
+ data contained too many double zeros for *r* to be calculated

	Arachnida (excluding Acari)		Predatory Coleoptera (excluding *Zyras humeralis*)		All predators (excluding Acari)		*Zyras humeralis*		All non-predators		Collembola		Other non-predators	
Sample date	*r*	Sig.	*r*	Sig.	*r*	Sig.	*r*	Sig.	*r*	Sig.	*r*	Sig.	*r*	Sig.
23/11/94 to 30/11/94	0.25	ns	-0.21	ns	0.05	ns	+		-0.22	ns	0.05	ns	-0.26	ns
11/01/95 to 18/01/95	-0.26	ns	-0.31	ns	-0.39	ns	+		-0.20	ns	0.04	ns	-0.20	ns
05/04/95 to 10/04/95	-0.19	ns	-0.33	ns	-0.25	ns	-0.03	ns	0.14	ns	-0.08	ns	0.33	ns
15/05/95 to 19/05/95	-0.18	ns	-0.35	ns	-0.18	ns	0.09	ns	0.39	ns	0.18	ns	0.39	ns
10/07/95 to 14/07/95	-0.22	ns	-0.14	ns	-0.14	ns	-0.09	ns	0.37	ns	0.37	ns	0.22	ns
28/08/95 to 01/09/95	-0.27	ns	-0.03	ns	-0.35	ns	-0.27	ns	-0.23	ns	-0.33	ns	0.12	ns
08/11/95 to 14/11/95	-0.42	*	-0.25	ns	-0.40	ns	-0.20	ns	-0.08	ns	-0.32	ns	-0.06	ns
11/02/96 to 21/02/96	0.38	ns	0.11	ns	0.26	ns	+		0.06	ns	0.02	ns	0.13	ns
02/04/96 to 08/04/96	-0.02	ns	-0.44	*	-0.33	ns	-0.29	ns	-0.44	*	-0.50	ns	-0.42	*
23/06/96 to 26/06/96	-0.71	**	-0.48	*	-0.79	***	-0.14	ns	-0.35	ns	-0.15	*	-0.51	**
Traps for all dates pooled	0.09	ns	-0.41	***	0.01	ns	0.35	**	0.06	ns	0.19	**	-0.06	ns

Table 6.10: Correlation of *Formica rufa* against different invertebrate groups for Halse (18 traps) 1994 to 1996

* Significant at 0.05, ** significant at 0.01, *** significant at 0.001, ns = not significant
+ data contained too many double zeros for *r* to be calculated

	Arachnida (excluding Acari)		Predatory Coleoptera (excluding *Zyras humeralis*)		All predators (excluding Acari)		*Zyras humeralis*		All non-predators		Collembola		Other non-predators	
Sample date	*r*	Sig.	*r*	Sig.	*r*	Sig.	*r*	Sig.	*r*	Sig.	*r*	Sig.	*r*	Sig.
23/11/94 to 30/11/94	-0.15	ns	-0.52	*	-0.27	ns	+		0.02	ns	0.11	ns	-0.19	ns
11/01/95 to 18/01/95	+		+		-0.03	ns	+		-0.21	ns	-0.19	ns	-0.15	ns
05/04/95 to 10/04/95	-0.46	ns	0.17	ns	-0.17	ns	0.14	ns	0.01	ns	0.02	ns	-0.32	ns
15/05/95 to 19/05/95	-0.20	ns	0.03	ns	-0.34	ns	-0.29	ns	0.12	ns	0.10	ns	0.25	ns
10/07/95 to 14/07/95	-0.65	**	-0.29	ns	-0.60	**	-0.28	ns	-0.58	*	-0.28	ns	-0.62	**
28/08/95 to 01/09/95	-0.25	ns	-0.34	ns	-0.16	ns	-0.05	ns	0.14	ns	0.13	ns	-0.13	ns
08/11/95 to 14/11/95	-0.38	ns	-0.46	ns	-0.43	ns	0.30	ns	-0.44	ns	0.32	ns	-0.56	*
11/02/96 to 21/02/96	0.26	ns	0.55	*	0.54	*	+		0.11	ns	0.35	ns	-0.03	ns
02/04/96 to 08/04/96	-0.38	ns	-0.55	*	-0.47	*	0.51	*	-0.33	ns	-0.45	ns	0.10	ns
23/06/96 to 26/06/96	-0.29	ns	-0.27	ns	-0.22	ns	0.06	ns	-0.06	ns	-0.51	*	0.16	ns
Traps for all dates pooled	0.05	ns	-0.32	***	0.12	ns	0.49	***	-0.03	ns	0.06	ns	-0.04	ns

Table 6.11: Correlation of *Formica rufa* against different invertebrate groups for Control Ants (12 traps) 1994 to 1996

* Significant at 0.05, ** significant at 0.01, *** significant at 0.001, ns = not significant
\+ data contained too many double zeros for *r* to be calculated

	Arachnida (excluding Acari)		Predatory Coleoptera (excluding *Zyras humeralis*)		All predators (excluding Acari)		*Zyras humeralis*		All non-predators		Collembola		Other non-predators	
Sample date	*r*	Sig.	*r*	Sig.	*r*	Sig.	*r*	Sig.	*r*	Sig.	*r*	Sig.	*r*	Sig.
23/11/94 to 30/11/94	0.21	ns	-0.49	ns	-0.22	ns	0.48	ns	-0.06	ns	0.51	ns	-0.67	*
11/01/95 to 18/01/95	0.30	ns	0.22	ns	0.16	ns	+		-0.53	ns	-0.20	ns	-0.54	ns
05/04/95 to 10/04/95	-0.04	ns	0.15	ns	0.24	ns	0.10	ns	0.15	ns	0.09	ns	0.08	ns
15/05/95 to 19/05/95	-0.13	ns	-0.76	**	-0.37	ns	-0.22	ns	0.25	ns	0.22	ns	0.30	ns
10/07/95 to 14/07/95	-0.67	*	-0.31	ns	-0.68	*	-0.27	ns	-0.49	ns	-0.18	ns	-0.65	*
28/08/95 to 01/09/95	-0.23	ns	0.06	ns	-0.35	ns	-0.42	ns	0.08	ns	-0.06	ns	0.34	ns
08/11/95 to 14/11/95	-0.24	ns	-0.16	ns	-0.17	ns	+		0.04	ns	+		0.04	ns
11/02/96 to 21/02/96	0.42	ns	-0.10	ns	-0.05	ns	+		0.52	ns	0.29	ns	0.58	ns
02/04/96 to 08/04/96	-0.05	ns	-0.27	ns	-0.06	ns	0.48	ns	0.51	ns	0.09	ns	0.48	ns
23/06/96 to 26/06/96	-0.21	ns	0.47	ns	0.06	ns	0.03	ns	-0.60	*	+		-0.60	*
Traps for all dates pooled	0.07	ns	-0.27	**	0.08	ns	0.40	**	0.26	**	0.32	***	0.10	ns

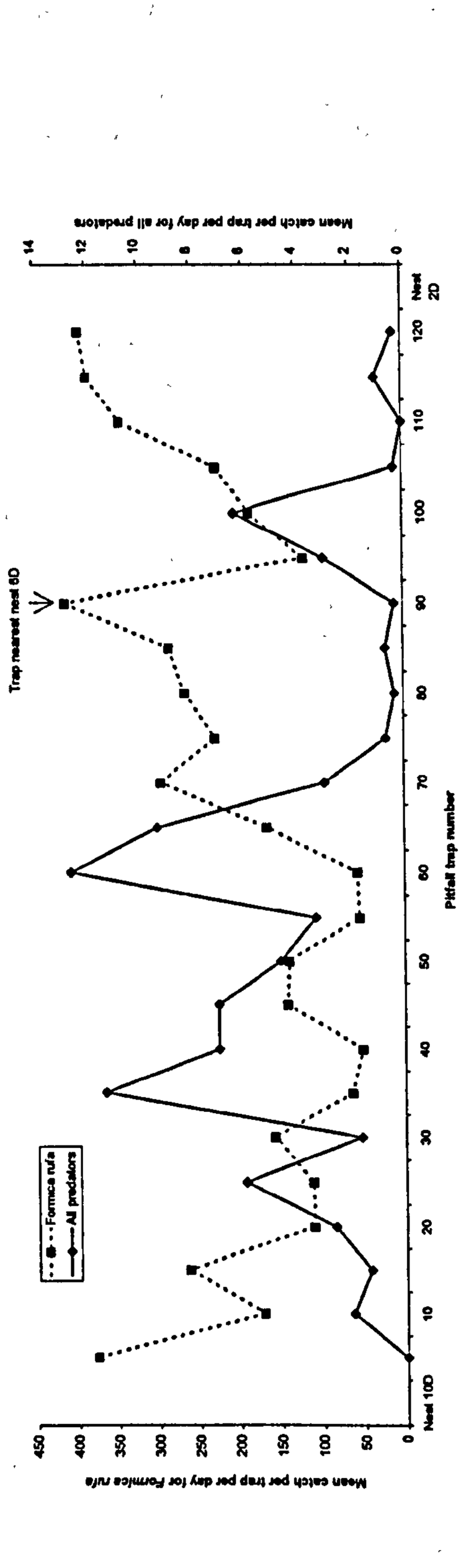


Figure 6.18: Abundance of *Formica rufa* and all predators along the pitfall trap line between nests 10D and 2D at Dimsdale for June 1996

r=0.79, $p<0.001$

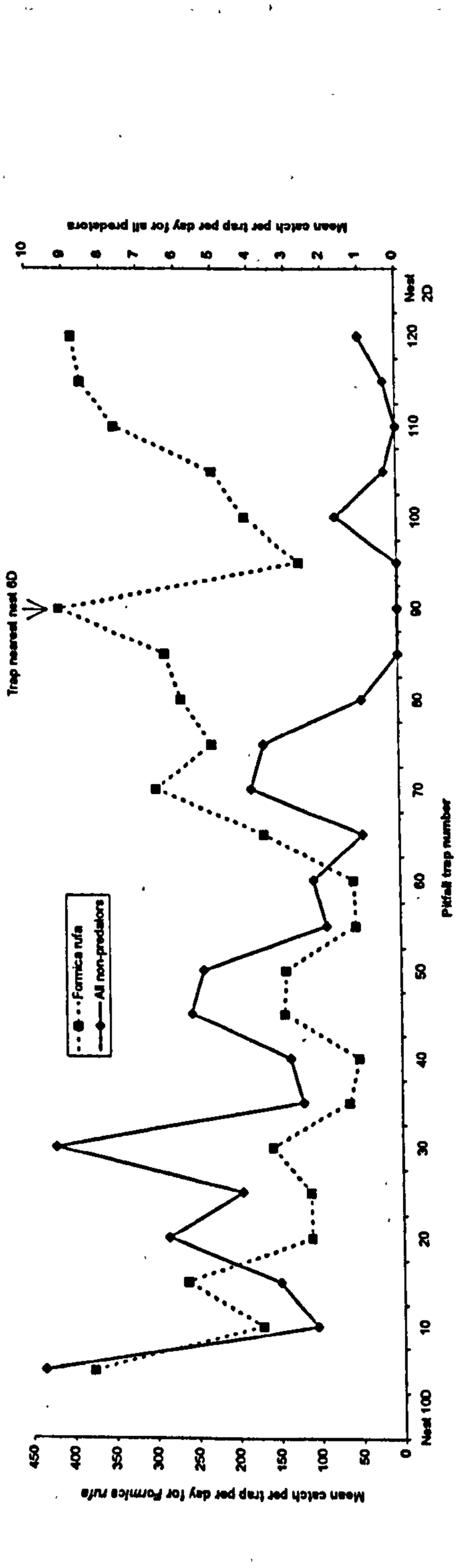


Figure 6.19: Abundance of *Formica rufa* and all non-predators along the pitfall trap line between nests 10D and 2D at Dimsdale for June 1996

r=0.35, $p>0.05$

For Control ants there were 12 traps for each sampling date and 120 traps for the pooled data. For the Arachnida group, only July 1995 showed a significant negative correlation (r=-0.67, p<0.05) with *F. rufa*, although seven dates showed negative association. Overall (pooled data), there was no significant correlation between the Arachnida group and *F. rufa* (r=0.07, p>0.05). The predatory Coleoptera group (pooled data) showed an overall significant negative correlation (r=-0.27, p<0.01) with *F. rufa*. For the all predators' group, July 1995 showed a significant negative correlation (r=-0.68, p<0.05). For the non significant correlations, all were negative except January 1995, April 1995 and June 1996. Overall (pooled data), the all predators' group showed no significant correlation (r=0.08, p>0.05) with *F. rufa*. For the non-predators' group, the results show no pattern, June 1996 shows a significant negative correlation (r=-0.60, p<0.05) with *F. rufa*. For the non significant results, six were positive and three negative. Overall (pooled data), the non-predators' group shows a significant positive correlation (r=0.26, p<0.01) with *F. rufa*. For Collembola, there was an overall (pooled data) significant positive correlation (r=0.32, p<0.001) with *F. rufa*. For other non-predators, there was no overall significant correlation. November 1994, July 1995 and June 1996 showed significant negative correlation (r=-0.67, p<0.05; r=-0.65, p<0.05 and r=-0.60, p<0.05) with *F. rufa*. *Z. humeralis* (pooled data) showed overall significant positive correlation (r=0.40, p<0.01) with *F. rufa*.

6.4 Generalising the pitfall trap results across whole foraging areas

Chapter four showed how foraging areas, as defined by the trails to trees method, show seasonal change. Figure 6.20 to Figure 6.29 show graphs of the mean number of *F. rufa* caught per trap per day for the transect line between nests 10D and 2D at Dimsdale, and Figure 6.30 to Figure 6.39 for the transect line between nests 9H to 7H at Halse. The boundaries of the foraging areas of the nests which cross the pitfall trap transect lines have been marked. These boundaries are taken from the whole site counts, which where only conducted when *F. rufa* was active. The sampling dates for the pitfall traps and the whole site counts do not correspond exactly, but the whole site counts were done as close to the pitfall trapping dates as was practically possible. The trails to trees were assessed once, on one day, whereas the pitfall traps were open for a number of days. Therefore, changes in weather affected these counts more than the pitfall trap counts.

From Figure 6.20 to Figure 6.39, the marked boundaries generally show good agreement with the low points in mean numbers of *F. rufa* caught per trap per day. In the warmer months (April 1995, May 1995, July 1995, August 1995, June 1996), the mean numbers of *F. rufa* caught per trap per day are never zero. There is not a "no ant" zone between foraging areas, rather areas of lower activity. However, trails to trees are recorded on the basis of category two or above on the abundance scale (Table 4.1) and thus this "blanket effect" of *F. rufa* (section 4.2.1.3) is not reflected in the foraging area diagrams.

Figure 6.20: Mean catch per day of *Formica rufa* from pitfall traps for November 1994 at Dimsdale

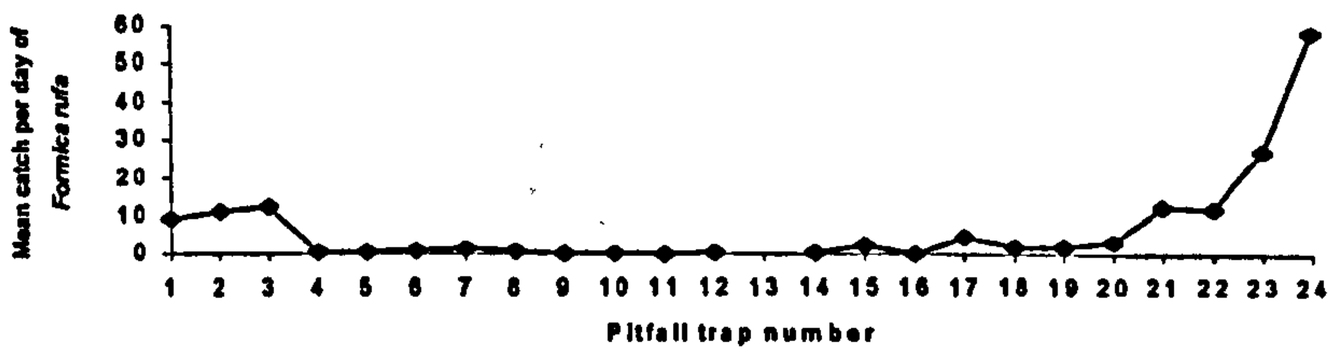


Figure 6.21 Mean catch per day of *Formica rufa* from pitfall traps for January 1995 at Dimsdale.

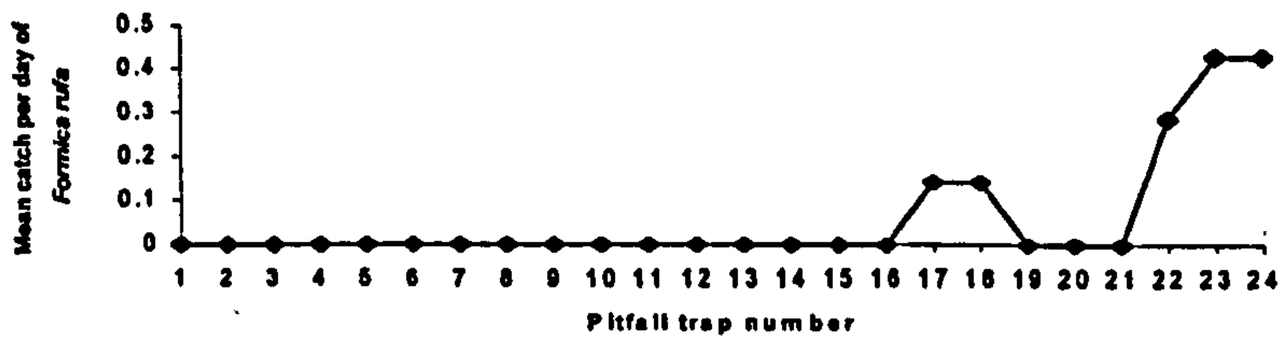


Figure 6.22: Mean catch per day of *Formica rufa* from pitfall traps for April 1995 at Dimsdale. Boundaries of foraging areas from Figure 4.46 marked.

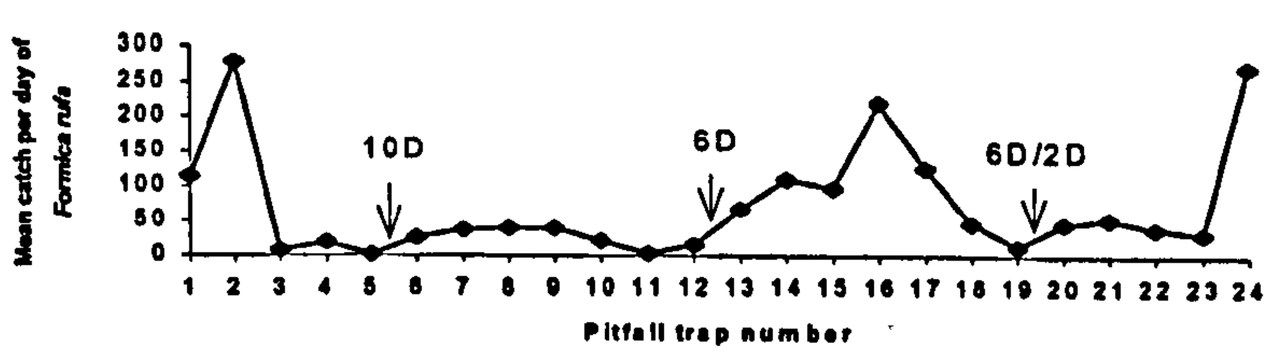


Figure 6.23: Mean catch per day of *Formica rufa* from pitfall traps for May 1995 at Dimsdale. Boundaries of foraging areas from Figure 4.47 marked.

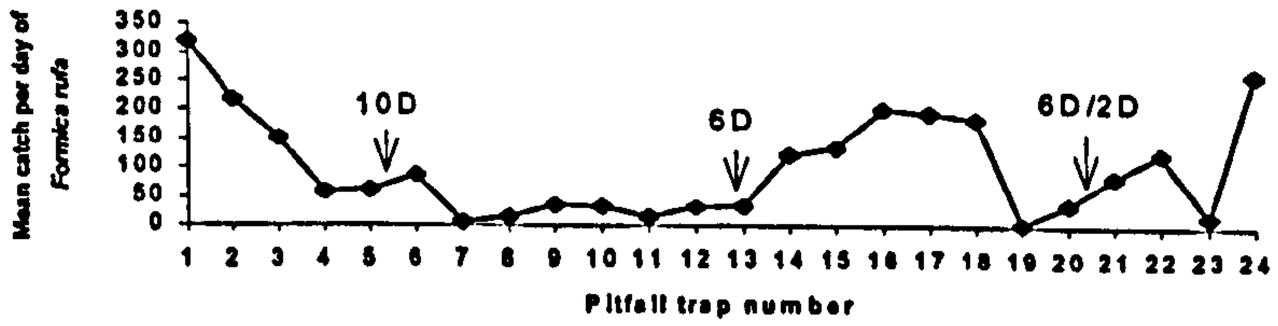


Figure 6.24: Mean catch per day of *Formica rufa* from pitfall traps for July 1995 at Dimsdale. Boundaries of foraging areas from Figure 4.48 marked.

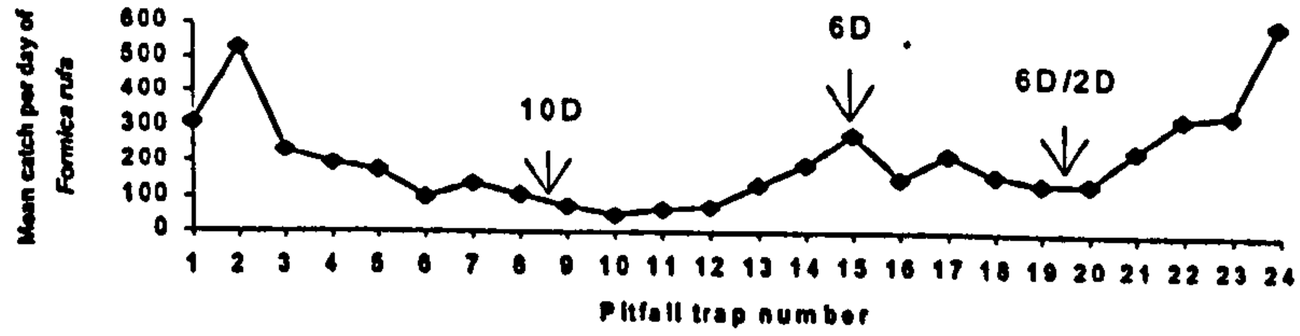


Figure 6.25: Mean catch per day of *Formica rufa* from pitfall traps for August/September 1995 at Dimsdale. Boundaries of foraging areas from Figure 4.49 marked.

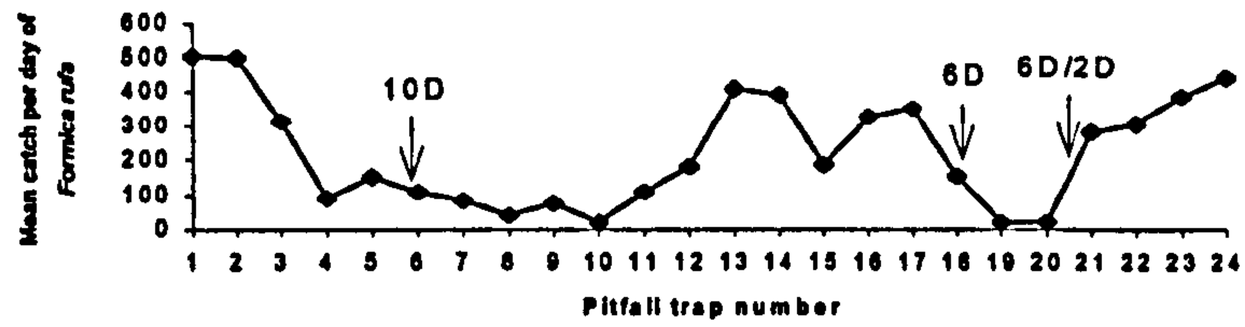


Figure 6.26: Mean catch per day of *Formica rufa* from pitfall traps for November 1995 at Dimsdale.

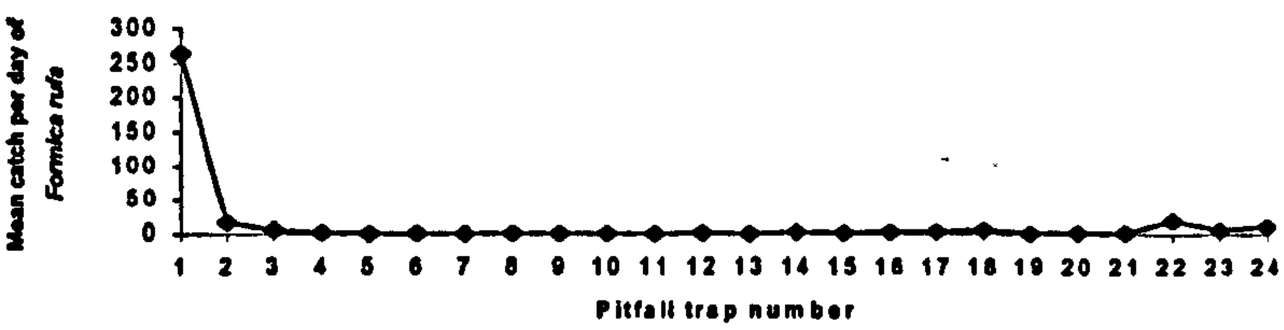


Figure 6.27: Mean catch per day of *Formica rufa* from pitfall traps for February 1996 at Dimsdale.

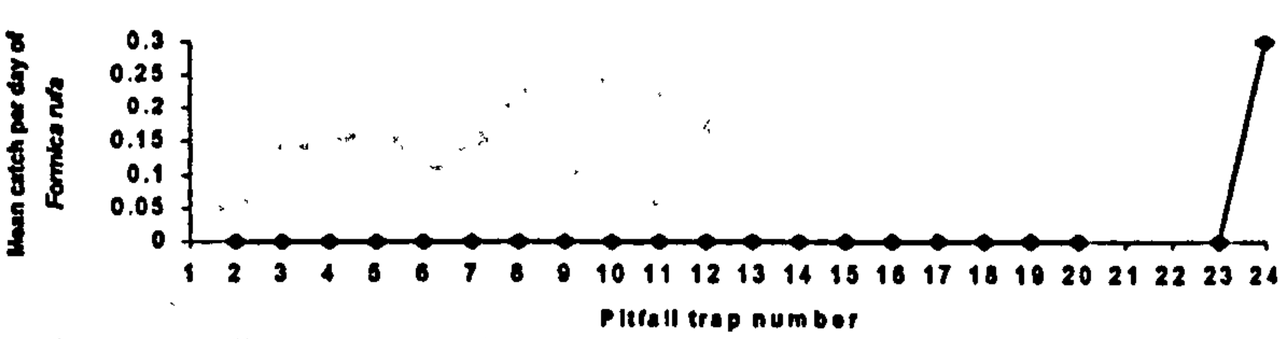


Figure 6.28: Mean catch per day of *Formica rufa* from pitfall traps for April 1996 at Dimsdale.

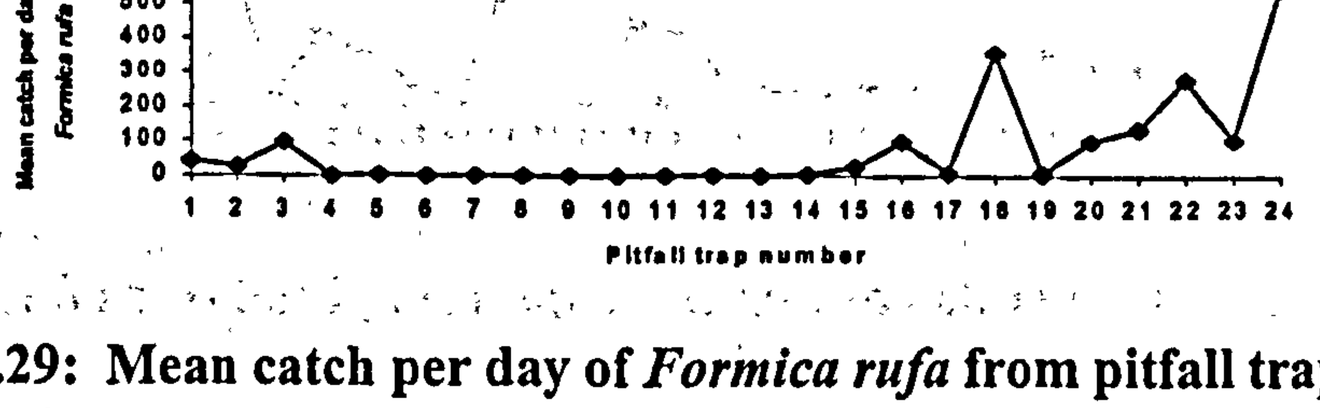


Figure 6.29: Mean catch per day of *Formica rufa* from pitfall traps for June 1996 at Dimsdale. Boundaries of foraging areas from Figure 4.52 marked.

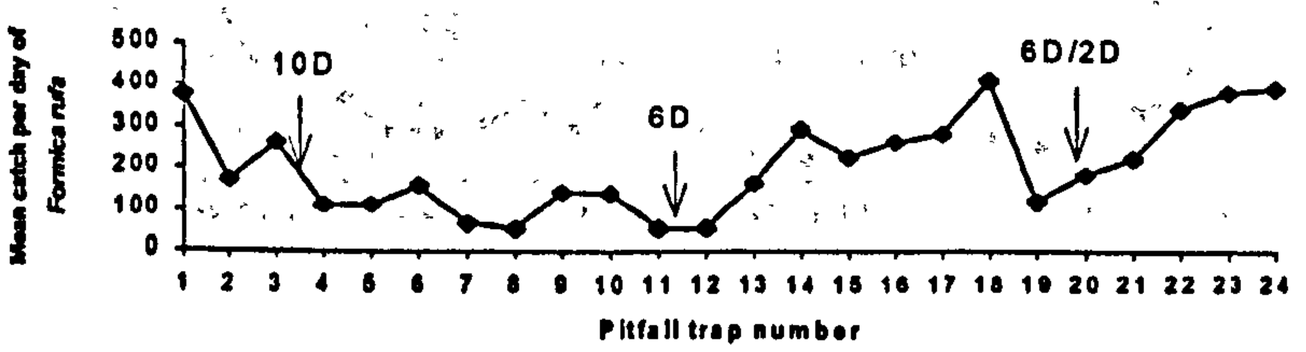


Figure 6.30: Mean catch per day of *Formica rufa* from pitfall traps for November 1994 at Halse.

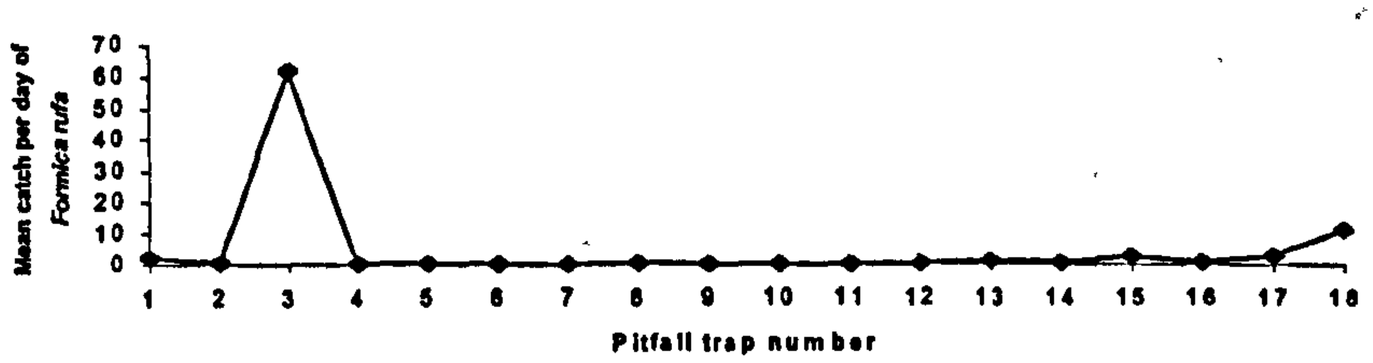


Figure 6.31: Mean catch per day of *Formica rufa* from pitfall traps for January 1995 at Halse.

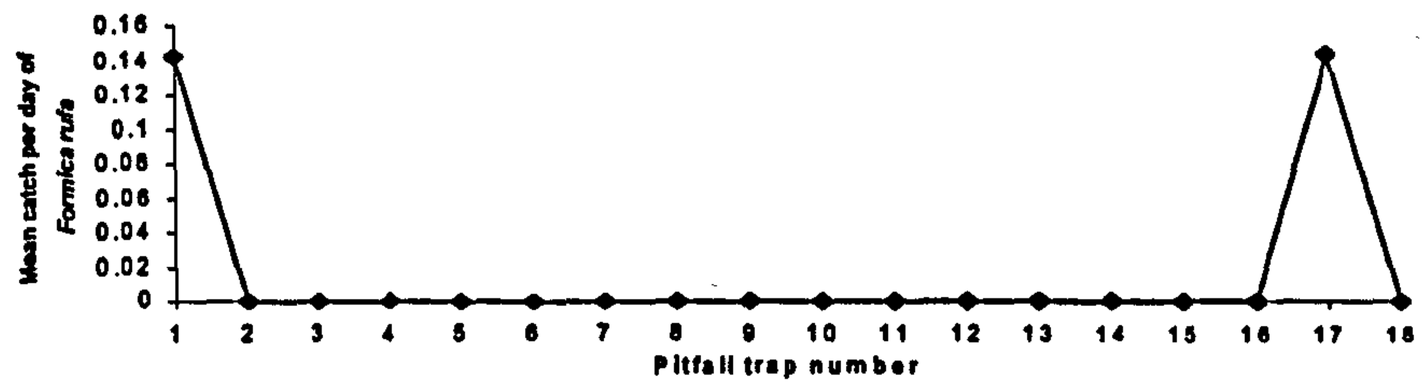


Figure 6.32: Mean catch per day of *Formica rufa* from pitfall traps for April 1995 at Halse. Boundaries of foraging areas from Figure 4.60 marked.

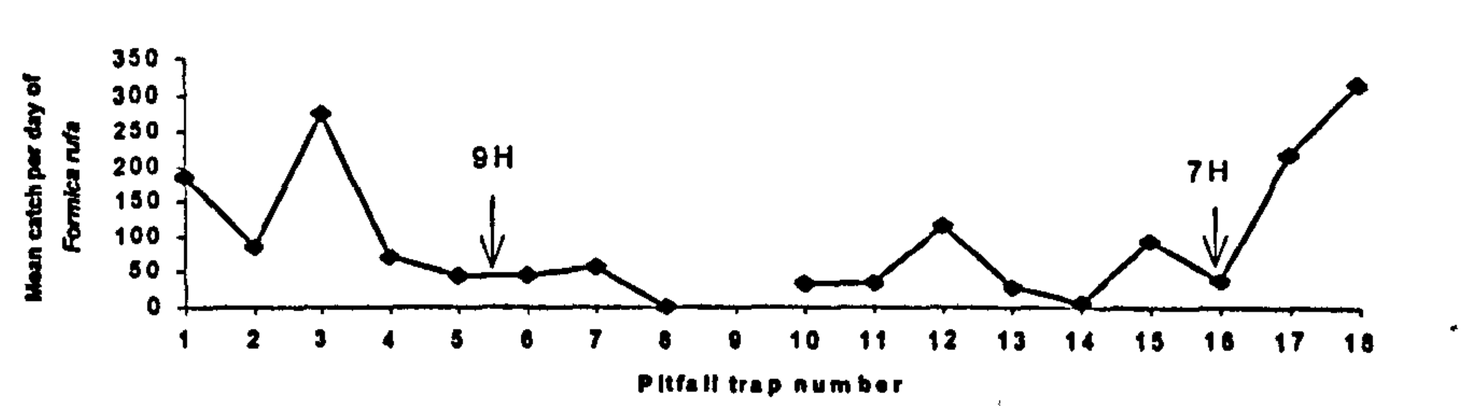


Figure 6.33: Mean catch per day of *Formica rufa* from pitfall traps for May 1995 at Halse. Boundaries of foraging areas from Figure 4.61 marked.

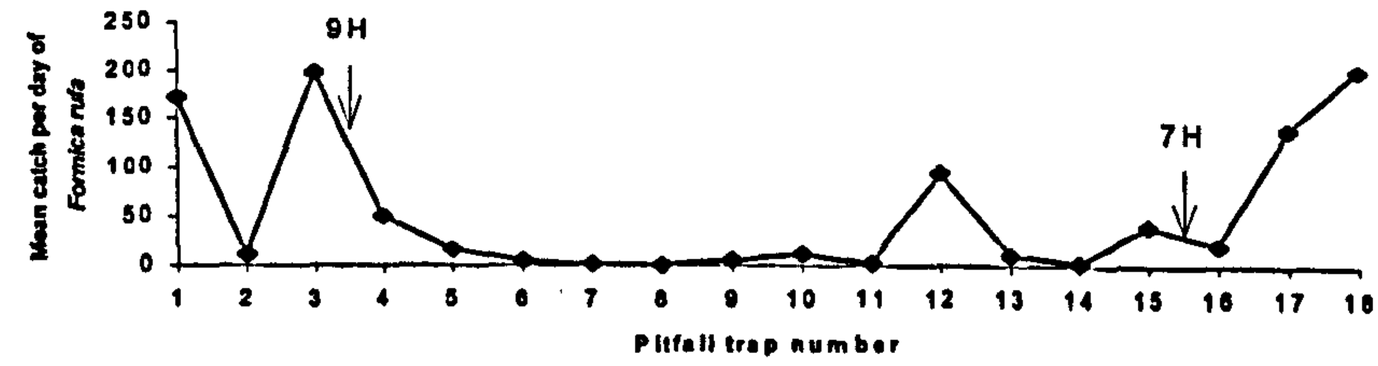


Figure 6.34: Mean catch per day of *Formica rufa* from pitfall traps for July 1995 at Halse. Boundaries of foraging areas from Figure 4.62 marked.

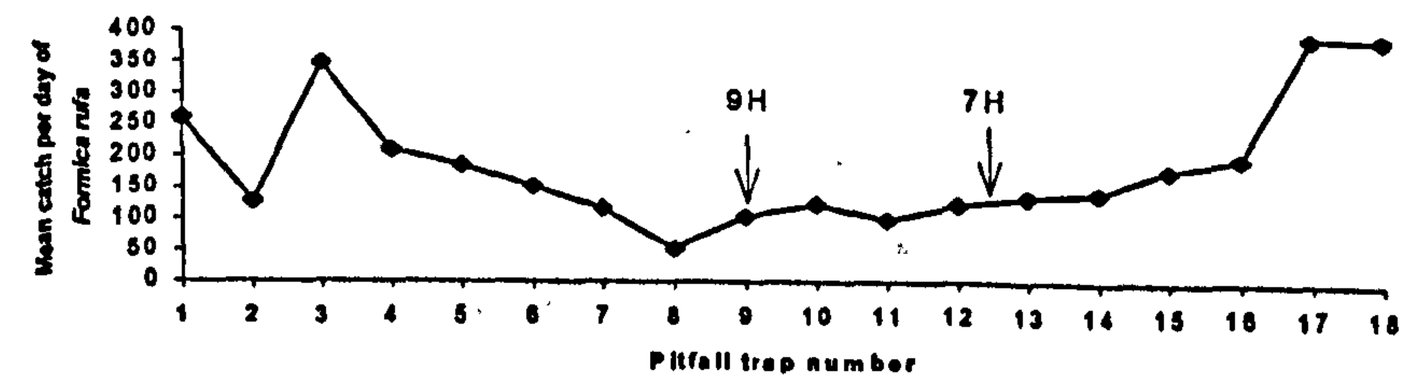


Figure 6.35: Mean catch per day of *Formica rufa* from pitfall traps for Aug/Sept 1995 at Halse. Boundaries of foraging areas from Figure 4.63 marked.

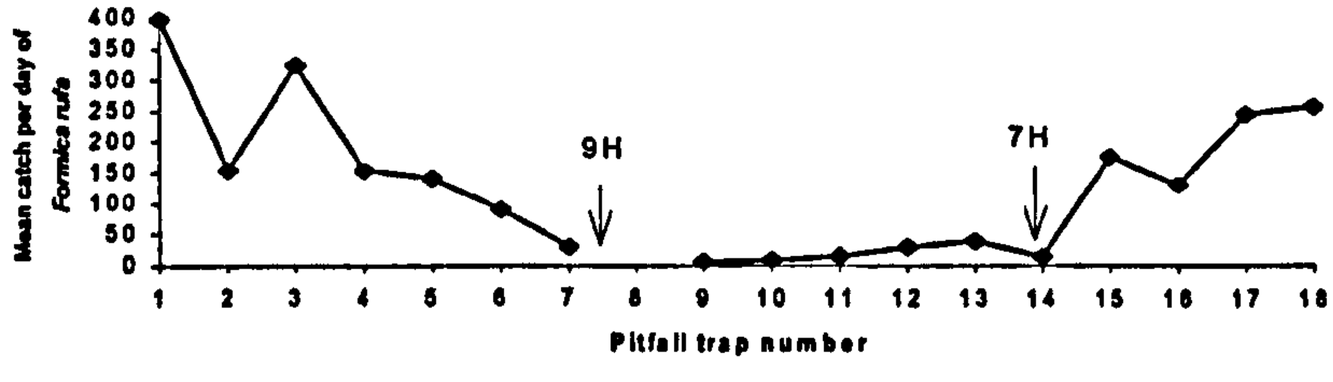


Figure 6.36: Mean catch per day of *Formica rufa* from pitfall traps for November 1995 at Halse.

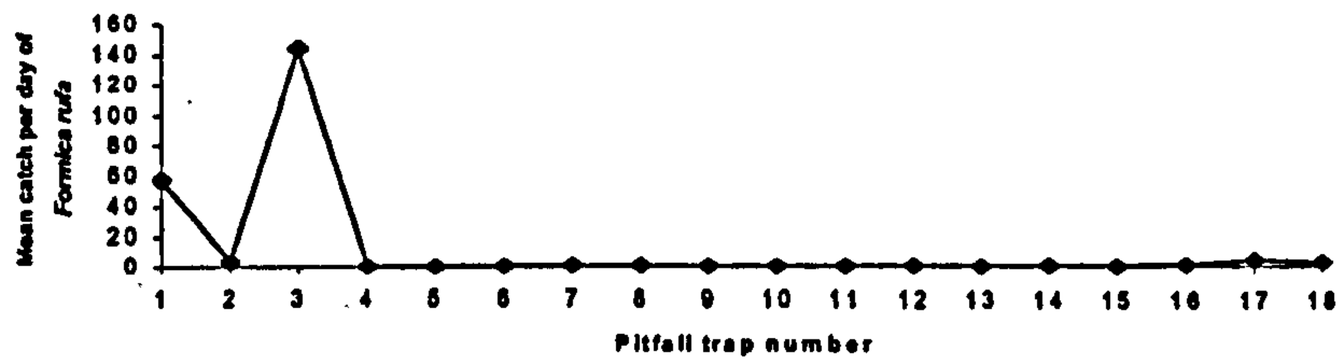


Figure 6.37: Mean catch per day of *Formica rufa* from pitfall traps for February 1996 at Halse.

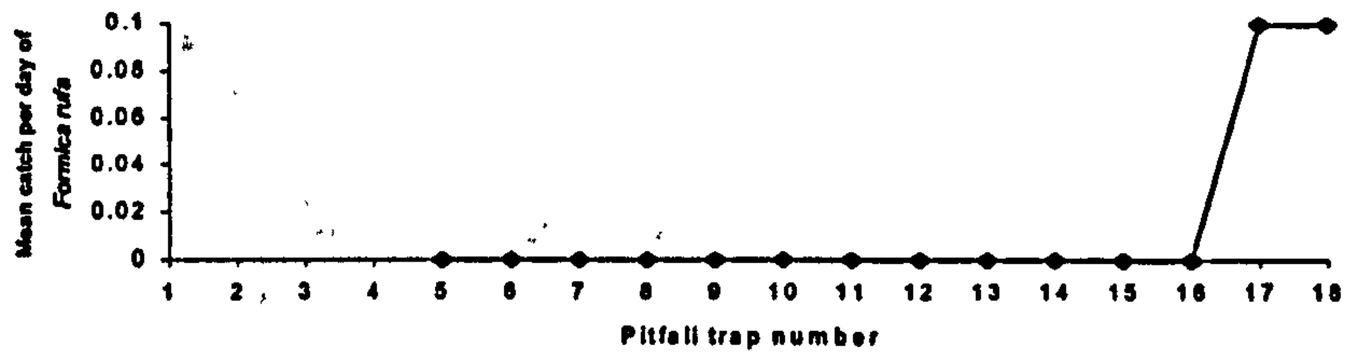


Figure 6.38: Mean catch per day of *Formica rufa* from pitfall traps for April 1996 at Halse. Boundaries of foraging areas from Figure 4.65 marked.

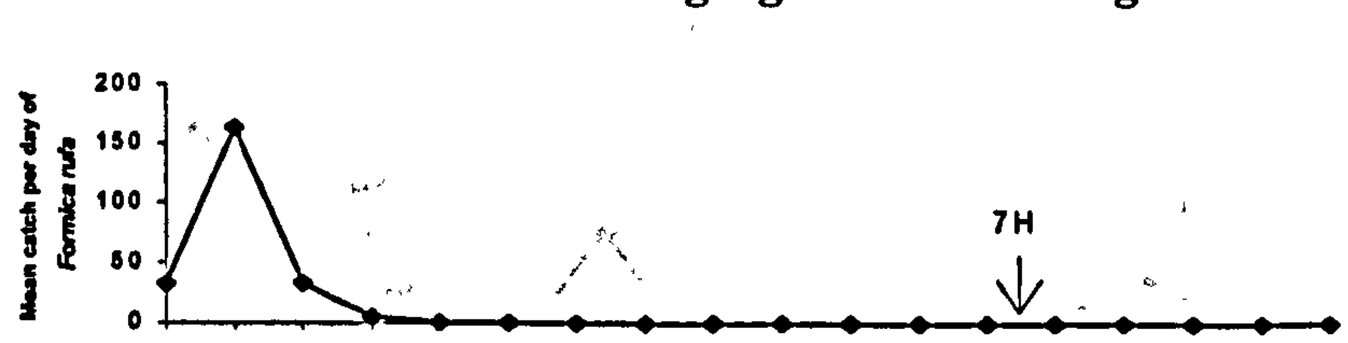
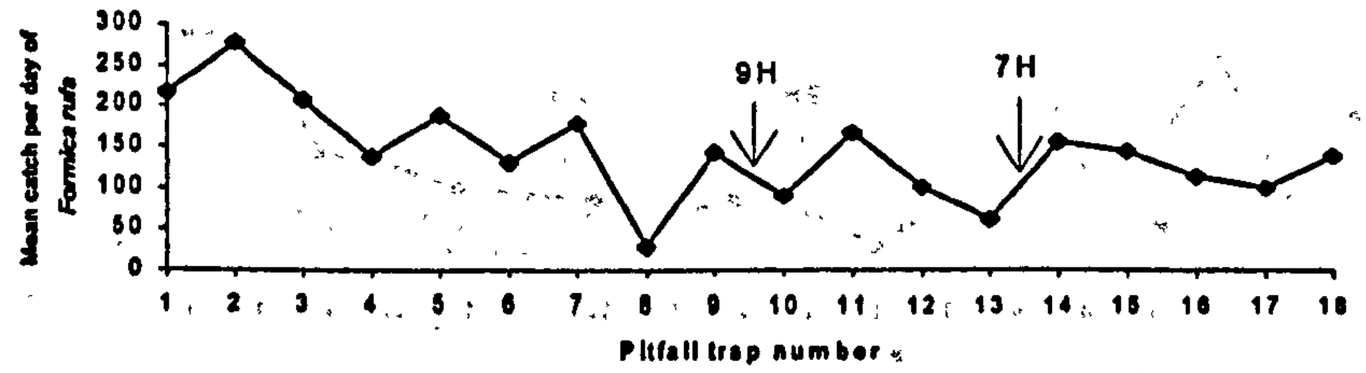


Figure 6.39: Mean catch per day of *Formica rufa* from pitfall traps for June 1996 at Halse. Boundaries of foraging areas from Figure 4.66 marked.



Sometimes it is not possible to be confident that the observed foraging area boundary is reflected in the pitfall traps. An example would be August 1995 (Figure 6.25) at Dimsdale. The average temperature for the time the pitfall traps were open, and the day the foraging account took place, was 16°C (Figure 3.7) and yet the boundary from the whole site foraging count does not seem to fit in with the pitfall trap results. For Halse, the April 1995 (Figure 6.32) and May 1995 (Figure 6.33) show a peak at trap 12, situated in between the boundaries for nests 9H and 7H. This could be due to *F. rufa* foraging from nest 2H, since it was difficult in this region to decide which nest *F. rufa* were coming from. The number of *F. rufa* caught in pitfall traps shows there is some activity in the colder months close to the nests (November 1994, January 1995, November 1995, February 1996, April 1996) even though there are no trails to trees and the foraging area is effectively zero. The graphs show how the foraging area boundary changes with time. All the boundaries show a gradual expansion from a minimum in winter to a maximum in July. There is then a gradual decrease to the winter minimum.

Mabelis (1979b), working with *Formica polyctena* and Holt (1955), working with *Formica* sp. (*lugubris* or *aquilonia*) showed that the density of workers between trails was lower than the density of workers on the trails. Since in this study the trap lines were in a straight line between two nests, points at which trails cross the trap line are likely to catch higher numbers of workers than would otherwise be expected taking into consideration distance from the nest. The results for trap number three at Halse illustrate this point (Figure 6.32 to Figure 6.36). The trap was at a point where a trail crossed to reach a heavily foraged oak tree and catches in this trap are higher than in traps one and two which are closer to the nest 9H. The correspondence between the foraging area diagrams and the pitfall trap results is sufficient for it to be reasonable to claim that had pitfall traps been laid from the nests, across the observed foraging area boundaries in other directions, similar results would have been obtained.

6.5 Discussion

The chi-square test results show that there was a significant association between All predators at Dimsdale, Halse and Control ants and trap position. Trap position is related to the presence of *F. rufa* since the trap lines run between two nests at each site. There was a significant association between All non-predators and trap position at Dimsdale and Halse. There were no significant associations for either group at Control no ants. One explanation is the presence of *F. rufa* is affecting the distribution of the other invertebrates. The relationship between *F. rufa* and other invertebrates was further investigated using Spearman's Rank Correlation.

Positive correlations, such as that between *Z. humeralis* and *F. rufa* would be expected because *Z. humeralis* is an obligate myrmecophile. Similarly, negative correlations would be expected between *F. rufa* and potential competitors such as predatory Coleoptera.

The correlations for the pooled data show some evidence that there is a negative correlation between predatory invertebrates and *F. rufa*. There is a significant negative correlation between predatory Coleoptera and *F. rufa* at all three sites where *F. rufa* is present (section 6.3.3). However, the results are not significant for Arachnida or for predators overall. Examining the results for each sample date separately at each site for these groups, reveal a complex situation. There are some significant negative correlations, but these do not occur at the same time across the three sites or at the same time between years or even in the same seasons. The only pattern which does emerge is that correlations between any of the predatory groups are almost always negative, although not necessarily significant.

Although the invertebrates were not identified to species, observation of the individuals trapped showed that *F. rufa* does influence the species composition. The pitfall traps for the Arachnida group for Control no ants showed less Opiliones than the *F. rufa* present sites (Table 6.3), There was often no Carabidae trapped in *F. rufa* present sites when there were Carabidae trapped at Control no ants for corresponding dates (Table 6.4). The individual Carabidae trapped at Control no ants were different, larger species than those trapped at *F. rufa* present sites (*pers. obs.*).

The literature on the relationship between *Formica* spp. and other predatory invertebrates gives a very mixed picture. For example, Brüning (1991, p. 479) found no significant difference in Araneae numbers trapped in relation to distance from a *F. polyctena* nest and van der Aart and de Wit (1971) found the presence of *F. rufa* did not effect the species composition or numbers of Araneae. In contrast, pitfall trapping by Gridina (1990) found that Arachnida showed an inverse relationship with *F. polyctena* and Cherix and Bourne (1980) found large spiders, especially Lycosidae, were far more abundant outside the foraging area of a super-colony of *F. lugubris*. Pętal and Breymeyer (1969) found that spiders made up between 11 and 38 % of the food of *Myrmica laevinodis*, *Myrmica ruginodis* and *Myrmica scabrinodis*. The peak in the number of spiders caught was in May, June and July; the density of the spider population was inversely proportional to the number of spiders taken by *Myrmica* spp. Finnegan (1974) found the presence of *F. lugubris*, introduced into Canada, generally reduced arthropods on the forest floor. Sudd and Lodhi (1981) found that numbers of some species of Araneae and Opiliones were fewer in an area where *F. lugubris* was present in one year but not the following year. Skinner (1976, p. 104) showed the presence of *F. rufa* reduced the number of spiders found in pitfall traps, but the data was too limited to draw any significant conclusions. Hammond (1992) pitfall trapped in Burnham Beeches on two occasions in August and September where *F. rufa* was present and where it was absent. Chilopoda, Opiliones and Coleoptera were significantly less abundant in *F. rufa* present area compared to the *F. rufa* free area. Adams (1991, p. 96) found numbers of the carabid beetle *Abax parallelepipedus* were significantly higher 25 m, as compared to 5 m, from a *F. rufa* nest.

The grouping of species into broad categories masks the diversity of their natural histories and sometimes the explanation lies in the differences in behaviour between species. Brüning (1991, p. 483) observed that lycosid spiders in leaf litter were

relatively undisturbed by *F. polyctena* even when the numbers of ants were very high. *F. polyctena* generally did not notice the lycosids and when they were detected, the lycosids were able to jump out of the way. Smaller spiders such as linyphiids ("money-spiders") were seen to pass close by *F. polyctena* without eliciting any reaction. Breymeyer (1966) also found Carabidae and Opiliones were most active at night whilst the Formicidae were most active during the day, allowing coexistence of potential competitors.

The distribution of the staphylinid myrmecophile, *Z. humeralis* is confined to areas where *F. rufa* is present. There is a significant positive association between *F. rufa* and *Z. humeralis* at all three sites where *F. rufa* is present (section 6.3.3). The primary host of the myrmecophilous staphylinid beetle, *Z. humeralis*, is reported by Donisthorpe (1909a, p. 422) as *Lasius fuliginosus* (Latreille). *F. rufa* and *Formica pratensis* are reported as secondary hosts. However, Fowler (1888, p. 57) reports *Z. humeralis* as being *"rather common in the London, Southern and Midland districts"* in the nests of *F. rufa*. In the months April to August, *Z. humeralis* was regularly trapped 30 m from the nearest nest in all three sites were it occurs (Dimsdale, Halse and Control ants, see Appendices K to N). This is in contrast to Skinner (1976, p. 106) who found *Z. humeralis* within 7 m of a *F. rufa* nest, but supports the view of Donisthorpe (1909b, p. 403) that *Z. humeralis "is often found in the runs outside the nest"* and Read (*pers. comm.*) that *Z. humeralis* in Burnham Beeches is often found running around with *F. rufa* on occasion some distance from the nest.

The time of year the trapping is done affects the species caught. For example, in this study, Trichoceridae were only trapped in the winter months. The level of taxonomic resolution also affects the interpretation of the data, for example in this study Staphylinidae were trapped all year round, but *Z. humeralis* was only trapped in the summer months. Patterns of temporal partitioning of species, such as those seen by Breymeyer (1966), would not show up in the current study because the traps were emptied only when full and not the twice daily, dawn and dusk, that would be necessary to track temporal change in the species caught in the pitfall traps.

There was a problem, particularly during the summer months, that the large numbers of *F. rufa* trapped filled the pitfall traps making it less likely that other invertebrates would be trapped. Possibly using larger traps might have alleviated this problem, although Hammond (1992) noted the same problem using much larger pitfall traps (7 cm diameter by 10 cm deep).

Mabelis (1979b) investigated the difference in density of *F. polyctena* in relation to distance from the nest and the proximity of a neighbouring nest. A transect of pitfall traps was laid between two *F. polyctena* nests 30 m apart. He marked a large number of workers with different colours for each nest. The boundaries between the nests were clear, but also overlapped. However, traps contained only marked workers from one nest, indicating the boundary changed between April and May. Only one occasion was one worker caught on the "wrong" side of the boundary. The catches per month increased from April to May, as did the furthest distance *F. polyctena* was trapped from

the nest, indicating as the season progressed the workers were travelling further to forage.

Chapter 7: Discussion

7.1 Summary of results

Chapter three described the biology of *Formica rufa*, the chosen experimental subject. The study sites (Dimsdale and Halse) within Burnham Beeches, the chosen study area, were described in detail. Nine permanent and eleven transient nests were recorded at Dimsdale and fifteen of each at Halse. The most favoured nest site was in or around a tree stump or fallen log. The gap in the canopy formed by the death of a tree, allows sunlight to warm the nest in the colder months of the year and the surrounding canopy provides some shade during the warmer months. Nest sizes varied from 0.2 m^2 to 7.07 m^2. The nest positions were not completely static. During the study period (January 1994 to June 1996), two nests died out, fourteen new ones appeared and three moved position. Nearest neighbour analysis showed a tendency towards regular spacing, but there was insufficient data to be conclusive. Analysis of the numbers of oak, beech and silver birch around permanent nests showed they tended to be sited in more open areas as compared to the composition around random points in the study sites. There was no tendency towards a particular combination of tree species within 20 m of a nest. Successful nests had a wide variation in numbers of oak, beech and silver birch found within 20 m of the nest.

Chapter four studied the variability in foraging patterns of *F. rufa* and its response to changes in food supply. Baiting was shown not to be a suitable method for determining colony limits, because baits were not equally attractive all year round. Workers and queens from different colonies were not aggressive towards each other and aggression could not therefore be used to determine which colonies workers had come from.

Regular detailed observations of trees close to four nests showed that oak trees were preferentially foraged and fidelity to trees visited was high between years. During July 1995, there was a switch away from foraging in oak trees to foraging in beech trees. A corresponding switch was not seen in the previous year, although there was a slight dip in foraging on oak in July 1994. Foraging on silver birch was important from April to July only; *Glyphina betulae* was the first aphid species to hatch. Silver birch was visited before aphids had hatched to collect exuding sap. Foraging on beech was constant at a low level (except during July 1995). There was a significant positive correlation between tree size (as measured by the girth) and the abundance of *F. rufa*. Large trees (girths > 1.4 m) were foraged more often than medium trees (girths 0.7 m to 1.4 m) which were foraged more often than small trees (girths > 0.7 m).

The numbers of each species of tree found in foraging areas were very variable and despite *Lachnus roboris* in oak trees being the main source of honeydew, a number of successful nests had low numbers of oak trees contained within their foraging areas. Foraging areas varied seasonally from zero in winter to a maximum in the summer. Summer foraging areas (July 1995) ranged in size from 709 m^2 to 4901 m^2 (6955 m^2 for a polydomous colony). During July 1995, foraging areas were reoriented so as to

include more beech trees. The foraging area of nest 10D, which was fed during 1995 and 1996, changed seasonally, but notable deviations from the pattern exhibited by other nests in the study site were not seen. There was some evidence from the results of the sexual production survey that an increased number of sexuals were produced by nest 10D (and 12D, connected by a trail to 10D). These two nests were the only nests in either study site to produce sexuals two years in succession. All other nests produced sexuals in either 1995 or 1996. Therefore it is possible that the extra resources supplied to nest 10D were channelled into producing sexuals.

There was some evidence that the grease-banding of trees within 25 m of nest 9H caused *F. rufa* workers to forage further north beyond the grease-banded area. However, this limited expansion did not compensate, in terms of numbers, for the grease-banded trees. Results from the quadrats showed that the number of workers recorded around the experimental and control nests in both study sites were similar.

Chapter five studied the relationship between *F. rufa* and the aphid *L. roboris*. *F. rufa* was seen regularly tending four species of aphid at Burnham Beeches. One aphid, *L. roboris* was the most important source of honeydew for *F. rufa*. The distribution of *L. roboris* was shown to be linked to that of *F. rufa*, since it did not occur in areas where *F. rufa* was not present. The phenology of *L. roboris* was described. Numbers of *L. roboris* peaked in mid to late May and fell to very low numbers during July and August. There was a small peak in numbers during the autumn. The amount of honeydew, collected from *L. roboris*, and carried by *F. rufa* was experimentally determined as an average of 1.15 mg per worker. This value was compared to other values from the literature and was found to be low. However, the average weight of an unladen worker was also much lower. The estimated total amount of honeydew transported back to one colony per year ranged from 13.5 kg $year^{-1}$ to 58.5 kg $year^{-1}$. The amount of insect prey transported in one year was not experimentally determined and estimates from the literature vary as to the relative proportions of honeydew and insect prey in the diet. Using the value of 15 % insect prey from Skinner (1980a) and Adams (1991) who both worked on *F. rufa* in the UK, a value of 5.2 kg $colony^{-1}$ $year^{-1}$ for Dimsdale and 4.1 kg $colony^{-1}$ $year^{-1}$ for Halse was estimated. The proportion of NPP moved by *F. rufa* was estimated as between 0.12 % and 0.47 %.

Chapter six examined the relationship between *F. rufa* and other ground living invertebrates. Pitfall trap lines between two nests were set in three *F. rufa* present sites and one trap line was put in a *F. rufa* free area. A one sample chi-square test was performed for All predators and All non-predators at each study. The results show that there was a significant association between All predators at Dimsdale, Halse and Control ants and trap position. Trap position is related to the presence of *F. rufa*. There was a significant association between All non-predators and trap position at Dimsdale and Halse. There were no significant associations for either group at Control no ants. One explanation is the presence of *F. rufa* is affecting the distribution of the other invertebrates. The relationship between *F. rufa* and other invertebrates was further investigated using Spearman's Rank Correlation.

A significant positive correlation was found, at all three *F. rufa* present sites between the presence of *F. rufa* and the staphylinid beetle, *Zyras humeralis* which is an obligate myrmecophile (Table 7.1). A significant negative correlation was found between the presence of predatory Coleoptera and the presence of *F. rufa*, at all three *F. rufa* present sites (Table 7.1). In general, as the boundary of the foraging area of *F. rufa* is approached, there is an increase in the numbers of predatory Coleoptera. Carabidae were often found in the *F. rufa* free area, but were rarely caught in the *F. rufa* present sites.

When considering the all predators group it was found that there was no significant correlation with the abundance of *F. rufa* at all three sites. In terms of numbers caught in pitfall traps, Arachnida were the most abundant and most of these were Opiliones. Here too there was no significant correlation (section 6.3.3).

The only significant correlation for all non-predators and *F. rufa* occurred at Control ants. The experimental manipulation of the food supply did not affect the numbers of *F. rufa* caught in pitfall traps at Dimsdale and Halse, so the absence of significant correlations is unlikely to be due to this factor. This difference must be accounted for by some other environmental factor which has not been considered, such as a difference in vegetation cover. There were positive correlations for Collembola and *F. rufa* for two out of the three sites. It is known that some species of Collembola are myrmecophiles and that some species demonstrate aggregated distribution patterns. The former characteristic could explain the positive correlation with *F. rufa*. The absence of a correlation at Halse could be explained by differences in ground vegetation between the three sites (Appendix J). For example, an abundance of cushion moss near nest 10D at Dimsdale would provide a suitable habitat for Collembola; these insects are most abundant in areas of high relative humidity such as might be found in association with moss (Imms 1970). Evidence for this is seen in the pitfall trap data where high numbers of Collembola were caught in traps near nest 10D (Appendix K). However there is insufficient data for a proper analysis.

Table 7.1: Summary of correlations for different invertebrate groups with *Formica rufa* for pooled data for Dimsdale, Halse and Control ants

+ significantly positively correlated, - significantly negatively correlated, ns = not significant

	Dimsdale	Halse	Control ants
All predators	ns	ns	ns
Arachnida	ns	ns	ns
Predatory Coleoptera	-	-	-
Zyras humeralis	+	+	+
All non-predators	ns	ns	+
Collembola	+	ns	+
Other non-predators	ns	ns	ns

7.2 Resilience to change

F. rufa in Burnham Beeches shows a classic trunk trail system of foraging (Hölldobler and Wilson 1990, p. 404). In this system trails to aphid bearing trees are established early in the season. When the workers emerge after the winter, obtaining carbohydrate for energy is important and strong trails develop to sources of sugar such as sap and early emerging aphids. In addition to strong trails to heavily foraged trees, some foraging occurs on other trees. Should a rich food source be discovered, *F. rufa* can quickly exploit it. The trails are used throughout the season as the aphids are a stable renewable source of honeydew. However, the reorientation of the foraging areas seen principally in July 1995, shows their ability to respond to changes in food supply. Insect prey is scavenged or captured when it is encountered. Ant colonies exploit the environment by social means and their flexible responses enable them to adjust to environmental change (Hölldobler and Wilson 1990, p. 378). One of the challenges of optimal foraging theory is how can it work if *F. rufa* is not omniscient. The rules for foraging must be very simple given the relatively simple nature of the arthropod central nervous system i.e. "rules of thumb", quick decisions based on simple stimuli which work adequately most of the time (Rosengren and Sundström 1987; Hölldobler and Wilson 1990, p. 378). Some foraging behaviour in ants can potentially be explained in terms of the application of a simple rule. Work by Cosens and Toussaint (1985) and Traniello (1987) on *Formica aquilonia* and *Formica schaufussi* Mayr respectively showed that individual foragers of return to a site at which food has been discovered, providing that the food source is maintained. The application of this simple rule leads to phenomena such as site allegiance in individual foragers and route fidelity. Another simple rule might be something like "follow a trail" (it will probably lead to food). However, it is counteradaptive for *F. rufa* to "optimise" by following such rules with 100 % efficiency. By only following trails established early in the season to aphid bearing trees, individual foragers receive a larger individual reward than a forager who leaves the trail, but without such "lost" foragers resources unpredictable in space and time, such as insect prey, might never be discovered (Rosengren and Sundström 1987). Such recruitment inaccuracy therefore allows a quick discovery and appropriation of available resources (Pasteels, Deneubourg and Goss 1987). For a discussion on the general principle see Allen and McGlade (1987).

Gordon (1995) studied the year to year stability of foraging areas of the granivorous desert ant *Pogonomyrmex barbatus*. Although these ants are generally thought of as having a stable territorial system, they use different foraging trails from day to day. A mature colony may have up to eight habitual foraging directions, of which it uses three to five times a day. She found that only about half of the foraging area used by a colony one summer was used by it the previous summer. There was no core foraging area. It is unlikely that the same site consistently provides seeds of the same abundance year after year.

The top predator in Burnham Beeches is the red fox and there has been much research into the size and stability of fox territories. For example, Doncaster and Macdonald (1991) investigated the spatial organisation of urban red foxes in Oxford. They found

that territories in the suburbs of the city were spatially stable, but those within the city drifted continually, but in a structured way. The city red foxes maintained exclusive territories by maintaining the spacing between social groups rather than the more usual fixed location. The home ranges of the city foxes averaged 93.4 ha ± 10.7 ha and suburban foxes averaged 54.3 ha ± 5.3 ha. For species which hunt in packs, territory size generally increases as pack size increases (Macdonald 1983).

Territory size and stability in other vertebrates have also been widely studied in the UK. For example, intra-specific variation in home range size has received a lot of attention in the literature and has often been ascribed to food availability (Gittlemann and Harvey 1982, p. 60). For instance, the average size of groups of European badgers varies between 2 and 23 members and average territory sizes vary between 14 ha and 576 ha (Woodroffe and Macdonald 1993, p. 146). This variation in territory size has been shown by Kruuk and Parish (1982) to be due to food availability rather than group size.

Outside the UK, work by Fritts and Mech (1981) investigated the movements and territoriality of the grey wolf in Minnesota, USA. The number of individuals in the social unit varied between 2 and 9 and the territory size varied between 195 km^2 and 555 km^2. There was no distinction between summer and winter home ranges, but specific areas were used more or less intensively according to season. Territory size did change in relation to population size with an increase in numbers leading to a general decrease in territory size. Some boundaries shifted and entire territories moved when new territories were established by new breeding units. Territories were discrete, with little overlap. A study of the grey wolf (*Canis lupus* Linnaeus) in Alaska by Peterson, Woolington and Bailey (1984) describes how territory sizes change with changes in the size of the social unit. The size of a territory was very variable, between 177 km^2 and 1,556 km^2. Territory in the Felidae is often not clearly delineated, there can be large overlaps between adjacent home ranges. Male Felidae territories are larger than those of females. For males, access to females is important (Kruuk 1986, p. 365).

As with *F. rufa*, work on true top predators has shown that territories have continuity from year to year due to the persistence of the social group. The size and shape, however, may vary seasonally, with changing food availability and with changes to the number in the social group.

The experimental work also looked at more extreme variations in food availability, with the feeding of 10D and the grease-banding of trees around 9H. Neither of these experiments had a large effect.

It is possible to speculate as to why the foraging area of the fed nest (10D) changed very little. It would be a poor long term strategy for *F. rufa* to stop foraging amongst the trees when food was given in the nest. *F. rufa* could not know the food supply was going to continue being available in the nest, and indeed, in June 1996, it stopped being supplied. Work by Del-Claro and Oliveira (1993) showed the discovery of an alternative sugar source (simulated extrafloral nectaries) by *Camponotus* spp. did not lead to desertion of the membracids (*Guayaquila xiphias*) they were tending. Visitation

rates to aggregations of membracids were similar before and after discovery of the new sugar source.

Another consequence of ceasing or restricting foraging would be the loss of territory, possibly to the benefit of another nest. Lost territory would potentially be energetically costly to recover once the additional food source ceased. In addition, work on long term memory in the *Formica rufa* group by Rosengren and Fortelius (1986) demonstrated long-lasting individual memory based on spatially organised visual cues, retained through periods of isolation such as winter inactivity. Therefore, ceasing or restricting foraging could potentially lead to the loss of the collective memory of the colony of food sources as the routes would not be passed onto the new generation of workers.

Whilst the nest denied food (9H) did expand its foraging area a small amount, it did not compensate for the number of trees it lost access to. It is possible to speculate that the reduced number of trees foraged provided sufficient carbohydrate and protein for the colony to survive. The growth of a colony is indeterminate and under conditions of stress older colonies can revert to the size and caste composition of a younger colony (Hölldobler and Wilson 1990, p. 378). No sexuals were produced in 1996, though they were produced in 1995. Unfortunately, apart from 10D and 12D (see above), all the nests which produced sexuals in 1995 did not produce them in 1996, so it is not possible to confirm the hypothesis that the reduced food supply was compensated for by not producing sexuals in 1996. A longer term study would be required to confirm this hypothesis. Pontin (1961, 1969) used queen production as an index of colony success in his work with *Lasius flavus* and *Lasius niger*.

7.3 Interactions with other species

Chapter five showed that the proportion of NPP moved by *F. rufa* workers can be estimated as 0.20 % to 0.47 % for Dimsdale and 0.12 % to 0.30 % for Halse. Most solar radiation incident on an ecosystem is reflected and only 44 % occurs at wavelengths suitable for photosynthesis (Begon *et al.* 1986, p. 638). Much of this energy is lost through plant respiration, with only a small proportion going to make plant biomass which is then available to heterotrophs for consumption. At each trophic transfer, more energy is lost. For comparison, the amount of energy moved across the foraging area of a red fox can be calculated. Using data from Sargeant (1978), quoted in Saunders *et al.* (1993), an adult male fox is assumed to weigh 6 kg and has a foraging area of 45 ha (45×10^4 m^2) in a deciduous woodland which converts PAR to NPP with an efficiency of 0.75 % (section 5.6). It is estimated to consume 414 g of protein per day (9895 kJ day^{-1}, 8.0 kJ m^{-2} year^{-1}). The NPP of its foraging area is estimated as 7.7×10^9 kJ year^{-1}. Therefore the red fox moves an estimated 0.05 % of NPP across its foraging area.

It can therefore be seen that the energy flows created by *F. rufa* play an important role in the ecology of Burnham Beeches. The work in chapter six on the relationship between *F. rufa* and other ground living invertebrates shows some evidence that *F. rufa* has a structuring influence on the distribution of other invertebrate predators. The

predatory Coleoptera are potential competitors of *F. rufa* and so it is likely that these species will be spatially or temporally partitioned if the two species are to coexist. Large Carabidae were also absent from *F. rufa* present areas. The few Carabidae which were present in *F. rufa* areas were of different species to those found in the *F. rufa* absent area. The Opiliones are more omnivorous than the predatory Coleoptera and the absence of any significant correlation suggests their limited competition with *F. rufa*. It could be further suggested that the Opiliones avoid *F. rufa*, resulting in minimal ecological interference.

There are many examples of such spatial and temporal partitioning of different species which enable coexistence without continual conflict. For example, work by Breymeyer (1966) was described in chapter 2 (section 2.2) which showed a complex system of daily and seasonal partitioning between invertebrate predators from different families which allowed coexistence between them.

There are many examples in the literature of ways in which different ant species exploit the environment in such a way as to reduce or eliminate interspecific competition and thus coexist. The existence of dominance hierarchies has been well documented (Savolainen and Vepsäläinen 1988; Savolainen, Vepsäläinen and Wuorenrinne 1989; Hölldobler and Wilson 1990, p. 419) and the displacement of one species by another at a bait can be seen (Risch and Carroll 1982; Savolainen and Vepsäläinen 1988). This can be an important consideration in experimental design, since time therefore plays an important role in which species of ant maybe seen at a bait and it is possible to miss early arrivals which are quickly displaced by more dominant species. Displacement of *Myrmica ruginodis* by *F. rufa* on sugar baits was occasionally seen in the current study. A simple classification system is used. Level one species defend only their nests, level two species defend their nests and food supply and level three species defend their nests and all of their foraging area. It can be seen that this hierarchy also links to the types of foraging strategy described in chapter two (section 2.1.2). Differences in behaviour can reduce interference between species and thus permit coexistence. For example, *L. niger* and *L. flavus* live together in Wytham grasslands, England. *L. niger* nests in rotting stumps, beneath stones or in open soil and forages above and below ground. *L. flavus* is primarily a subterranean species which builds mounds in open soil (Pontin 1961, 1969). Foraging at different times is a well documented way (Hölldobler and Wilson 1990, p. 424) in which interspecific competition is reduced. Fellers (1989) describes the temporal separation, both daily and seasonal, of nine species of ant in a temperate woodland. The two common dominant species, *Prenolepis imparis* (Say) and *Formica subsericea* were most active at different times of the day and during different parts of the year.

7.4 Ecosystem Trophic Modules

The work done in this thesis can be used to comment on a wider issue in ecology. Chapter two (section 2.3) discussed how the lack of methodological standards is impeding progress in ecology. The move from conceptualising ecosystems to actual

observation and experimentation means identifying a boundary. Usually boundaries are made along zones of minimal interaction or exchange, although all processes may not map over the same volume or space. Studying different sets of interactions leads to different boundaries being defined (Reiners 1986). A method of standardising the definition of the boundary was suggested by Cousins (1990). He introduced the concept of delimiting the ecosystem by using the foraging area of the top predator. He called this unit the Ecosystem Trophic Module (ETM).

The nature of the fundamental object of ecological study has caused considerable friction in the ecological community (McIntosh 1980, 1985). The question is whether there is a real entity at the ecological level, or whether ecology is the aggregate of interactions at lower levels. These two positions may be usefully characterised as "holistic" and "reductionistic". Whilst both reductionism and holism accept a hierarchy of entities, their interpretation of an entity is fundamentally different. Ultimate reductionism reduces the complexity of nature to the level of fundamental particles; structures which appear real (to us) at higher levels are products of the interactions between particles. Where one structure begins and ends is largely a matter of convention and perception, since the only real structures are the fundamental particles. From this viewpoint, an ecosystem is merely a convenient way of describing a particular grouping of organisms and abiotic processes (which are in turn convenient groupings of smaller units, etc.). From a reductionist viewpoint, higher level behaviour is no more than a definable combination of lower level behaviours (Webster 1979, p. 123).

For holism however, levels above fundamental particles are also real. New properties emerge at a higher level when interactions at a lower level take place, which are not predictable from knowledge about the lower level i.e. behaviour at a higher level cannot be explained in terms of lower level behaviours (Webster 1979, p. 123). Life and consciousness are taken as the most important evidence for the truth of holism; their existence has never been predicted from knowledge of the interaction between the non-living constituents of an organism (Stewart and Cohen 1994). The existence of any emergent entity produces considerable theoretical problems. Often emergent entities are defined negatively as those things which have properties which cannot be deduced from the properties of the constituent parts. Thus properties may only be "emergent" because of lack of knowledge about these constituent parts (Pomeroy, Hargrove and Alberts 1988, p. 5).

Ultimate reductionism is an extreme position (Levins and Lewontin 1980, p. 51); to take seriously the claim that organisms are not real would make life impossible. However, strong holism is difficult for scientific studies because it introduces new entities with new properties which are not explainable in terms of lower level entities. On the other hand, unless all disciplines are to be eventually reduced to studying fundamental particles, it is necessary to make some holistic assumptions. Generally this tension between reductionism and holism is ignored and ecologists in their work believe organisms to be real. The scientist is trained to measure, assuming that what he measures exists (Salthe 1985, p. 4). The problem comes when there is no conventional agreement about what the object to be measured is, as is the case in ecology with the

existence or not of ecosystems as real objects for study. There is a spectrum of philosophical views on ecosystems from fairly extreme reductionists, who believe only in organisms (Simberloff 1980) to extreme holists such as Phillips, who believe that the ecosystem is a superorganism (Golley 1993). In between there are people such as Levins and Lewontin (1980) who appeal for pluralism in the interests of compromise. This disagreement about the nature of an ecosystem and this philosophical divide has led to contrary views on what ecosystems are and how they should be studied (McIntosh 1985, p. 201)

If an ecosystem entity existed, then it would have to be formed by ecological interactions between organisms (feeding, hunting, decomposing etc.). Whilst these can be investigated, described and measured, it is still difficult to define the whole that is formed by these interactions. In which case, how do we recognise it? Organisms are instantly recognisable as wholes but ecosystems are not. What is required is a property which occurs within the boundary of the entity but not outside of it. In the case of an organism, the property formed by the interaction of the non-living constituents of an organism is life. Life occurs within the boundary of the organism but not outside. In the case of ecosystem entities, a similar property is needed. This would allow the ecosystem entity to be recognisable, due to a discontinuity in the property.

Golley (1993) makes several suggestions for possible ecosystem level processes. Food webs are the first possibility. A conventional food web is a picture of what feeds on what and is necessarily an abstraction. The final food web diagram is the sum of feeding activities of individual organisms in the ecosystem. This cannot be considered as an emergent property (an ecosystem level property) because it is just the aggregation of the feeding relations - nothing new emerges. The second property considered by Golley (1993) is the flow of water and the chemicals carried by the water as sediment and dissolved materials as it exits a mountain watershed (he talks specifically about Coweeta Hydrological Laboratory, but this can be generalised to energy and matter flows through any ecosystem). Golley concludes that these flows constitute an emergent property at the ecosystem level because *"the outputs are not merely the sum of the component processes. The system output depends upon the interaction of the biota, the rock, the water, the atmosphere and the soil"* (Golley 1993, p. 193). The outputs must be the sum of the component inputs and processes otherwise the laws of conservation of energy and matter are violated. Therefore I conclude that nutrient flows into, within and out of ecosystems are not emergent properties. What might be considered an emergent property is if each ecosystem (or perhaps class of ecosystem) has a unique "signature" of flows (Pahl-Wostl 1995, p. 3). The last emergent property at the ecosystem level considered by Golley (1993) is reflectance of light. He concludes that it is an emergent property *"since it depends upon the canopies of the plants, their physiological state, the water conditions of the site, the presence of insects or disease organisms, and so forth"* (Golley 1993, p. 193). As with flows of matter, reflectance might be an ecosystem level property if it creates a unique signature.

It should be noted that describing energy and matter flows for a whole ecosystem is extremely difficult, time consuming and complex. It is hard to see how a unique

"signature" could be found in amongst all this information. However, it is Cousins' belief, though, that if this ecosystem signature could be found it would coincide with the foraging area of the top predator. This "shortcut" to a full ecosystem description would be very useful, and much simpler than full ecosystem studies.

Cousins' ETM approach lies on the holistic wing of the divide, since it claims that there are natural ecological boundaries. To reiterate from chapter 2 (section 2.3.1), the ETM hypothesis makes the claim that the boundary of the foraging area of a top predator corresponds to the boundary of an ecological unit. As can be seen from the discussion above, this is a difficult hypothesis to test experimentally. The foraging area of the top predator can be seen as an entity at the behavioural level of the top predator, the boundary occurring between where the top predator does and does not forage. If the ETM hypothesis is true, then in addition, there must be one or more ecosystem properties which exist within the foraging area of the top predator, and not outside it.

Cousins (1993, p. 78) suggested that the ecosystem structure *"is created by the flow of energy through the system. In ecosystems the path of energy dissipation and material flows is determined by feeding and respiration.* However, the problem with energy is that it is ubiquitous. Describing an ecological system in terms of energy flow is to miss out on the ecology, although the ecology is partially brought back in when the boundary of this "energy flow structure" is said to be coincident with the boundary of the foraging area of the top predator. Cousins fails to specify an ecosystem property which contains discontinuities. However, as discussed above this is not surprising because ecosystem properties have not been incontestably established. But it is therefore necessary to find an alternative approach if the ETM hypothesis is to be tested.

Detecting an entity when there are no clear cut boundaries is difficult. According to Salthe (1985, p. 29):

> *"we are driven here to a single defense of our discovery - we must show that when we measure yet other variables, or when we manipulate the data using other values for parameters in our system, we come up with discontinuities that map essentially the same region of (geographic or phase) space".*

Thus it is necessary to find other variables which can be measured and which may be related to any ecosystem properties. Cousins (1990) states that the ETM has a dynamical structure of the parts (organisms) which go to make it up. The nature of the structure is not specifically described, but Cousins sees it in terms of feeding relations (Cousins 1990) and the distribution of organisms (Cousins 1993). These two are not mutually exclusive.

All parts of a foraging area are not visited equally. Thus the foraging area has a degree of structure in terms of the (averaged) distribution of the top predator. Therefore, if there is an ecosystem structure located within the foraging area of the top predator, then this ecosystem structure should show some correlation with the structure of the top predator's foraging area. In fact, of course, the top predator is part of the ecosystem,

and so part of any ecosystem structure that might exist. However, from the point of view of investigating the ETM hypothesis, it is useful to view the top predator separately from the rest of the ecosystem, and then see if the structure of its foraging correlates with the distribution of other organisms. If the structure of the top predator's foraging area correlated with the distribution of other organisms within the foraging area, then this would provide evidence of ecosystem structuring corresponding to the top predator's foraging area.

The results of this study can, therefore, be used to speculate about the hypothesis that the structure of the top predator foraging area correlates with the structure of the rest of the ecosystem. Although an ant colony is not a top predator by the definition used by Cousins (1990, p. 272), ants show many parallels with carnivorous vertebrates. Hölldobler and Wilson (1990, p. 395) give examples of shared characteristics:

- the colony comprises many individuals which through co-operative actions often behave as a large organism
- the colony can be long-lived
- the colony is typically sheltered and aggressively defended
- there is evidence of competition within and between species (competition is expected to be most intense in large animals, close to the top of food chain)

These properties, and those discussed in section 2.3.1, do suggest that an ant colony would be a suitable system to show the properties Cousins ascribes to ETMs (Cousins *pers. comm.*). *F. rufa* shows all the properties above and in addition, they have few predators (Skinner 1976, p. 105).

From the point of view of testing the hypothesis that the structure of the top predator foraging area correlates with the structure of the rest of the ecology, *F. rufa* provides a favourable test case. At each instant of time, *F. rufa* has a true foraging area, since collectively the individuals are searching for food over an area, whereas in each instant of time a red fox, for instance, is at only one place. Therefore the relationship between the spatial distribution of *F. rufa* and other organisms is likely to be stronger than in the case of most predators.

The results from chapter four show that the foraging areas of *F. rufa* colonies are sufficiently discrete to be considered as an entity in their own right. The property inside the entity is foraging by *F. rufa*, which is not found outside of entity. Chapter four also demonstrated the resilience of the foraging area to changes in food supply and its nature as a unit in its own right, for example the foraging areas are relatively independent of the composition of the species of trees which make them up.

Having established that there is a bounded entity at the single species level, the important question is, can a *F. rufa* foraging area be considered as an ecological unit? The results from chapter six can be used to illustrate this point. If the foraging area of *F. rufa* was the boundary of an ecosystem entity, it is hypothesised that the distribution of *F. rufa* would influence the distribution of other invertebrates. The one sample chi-

square test results (section 6.3.3) show evidence that the presence of *F. rufa* affects the distribution of other invertebrates. There was a significant association for All predators and trap position at Dimsdale, Halse and Control ants. There was a significant association between trap position and All non-predators at Dimsdale and Halse. Trap position at these three sites is related to the distribution of *F. rufa*. There were no significant associations at Control no ants. It is possible that the significant associations for All non-predators can be explained by the non-homogeneous environment surrounding the pitfall traps rather than the presence of *F. rufa*. Numbers of Collembola dominant the catch per day for All non-predators and their presence may be linked to the presence of moss (Section 6.3.3). There was insufficient data to fully explore this possibility.

The relationship between *F. rufa* and other invertebrates was investigated in more detail using Spearman's Rank Correlation. The results are summarised in Table 7.1 are not all significant (negative or positive) which would indicate that a change in the distribution of *F. rufa* is not reflected in a change in the distribution of all other invertebrates. The clearest association is between the predatory Coleoptera and *Z. humeralis*, negative for the former and positive for the latter at all three sites. Both might be considered evidence for the existence of an ecosystem entity. In general, as the boundary of the foraging area of *F. rufa* is approached, there is an increase in the numbers of predatory Coleoptera. Cousins (*pers. comm.*) calls this the "edge effect". A similar situation could be envisaged with a true top predator and subordinate predators for example, lions and cheetahs. There is also some evidence that the presence of *F. rufa* reduces the numbers of Carabidae present and in *F. rufa* free areas, different, larger species are present.

However, when considering all predators it was found that there was no significant correlation with the abundance of *F. rufa* at all three sites, although there are some significant correlations at the family level (section 6.3.3). In terms of numbers caught in pitfall traps, Arachnida were the most abundant and most of these were Opiliones. Here too there was no significant correlation (section 6.3.3). Of greater interest from the point of view of an ecosystem entity is the relationship between *F. rufa* and non-predators. If the boundary of the foraging area of *F. rufa* is coincident with the boundary of an ecosystem entity, then changes in the distribution of *F. rufa* should be reflected in changes in the distribution of other invertebrates. The only significant correlation for all non-predators and *F. rufa* occurred at Control ants. Examining the correlations for individual sampling dates does not reveal any trends. There are approximately equal numbers of negative and positive correlations, indicating that the presence of *F. rufa* does not affect the numbers of non-predators in any consistent way. There is no evidence of a seasonal pattern; positive or negative associations are not related to particular times of the year.

Clearly combining data imposes limitations on the specificity of the correlations. However, most ecological studies could not hope to gather enough data to analyse species individually and aggregations are often made. Whilst aggregations may be undesirable (Polis 1991), the data presented here is as explicit as possible (Cohen *et al.*

1993). Most of the trapped invertebrates were identified to the level of the family and then the data for families with similar feeding habits were combined. The numbers of individuals caught for each family are in Appendices K to N and the basis of their aggregation into feeding groups is in Appendix O. Particularly in invertebrates, the adult and juvenile forms may have completely different feeding habits, for example caterpillars and butterflies. Therefore it sensible to separate them and make aggregations with species which feed in a similar way. Where there is good reason to expect that the presence of *F. rufa* will strongly affect the presence of other invertebrates, such as with predatory Coleoptera or *Z. humeralis*, the evidence from the data collected is unambiguous.

Taking a broad overall view, the one sample chi-square tests show evidence that the presence of *F. rufa* affects the distribution of other invertebrates. However, the correlation between abundance of *F. rufa* and other invertebrates is inconclusive i.e. the presence of *F. rufa* does not have wide ranging effects on the presence of other invertebrates. To a certain extent, this fits in with Cousins' views. The ETM is considered by Cousins (*pers. comm.*) to be a weak structure and therefore may be unlikely to show the broad wide-ranging effect that would be expected if it was a highly structured ecosystem entity. However, the question remains as to the minimum number of correlations necessary to show the existence of a weak structure. Even if an ETM were to exist as a weak structure, if it cannot easily be found, its value as a fieldwork tool is questionable.

In conclusion, no firm evidence has been found for the existence of an ecosystem entity corresponding to an ETM. The results from the study of *F. rufa* have been useful as a first investigation of ETMs. It has indicated the general theoretical problems of recognising an entity at the ecosystem level and pointed to the need to develop theory in this area. It has highlighted the need for Cousins' to specify more closely what the ETM hypothesis predicts would be found in the field, and to ensure that any further theoretical work is developed with experimental testing in mind. Cousins sees the ETM as an idea in its infancy and the suggestion that it is a weak structure means that it is necessary to further develop the theoretical framework, which he has begun in a number of further papers (Cousins 1993, 1994 and 1996). It is especially important that if strong correlations between distributions are not to be found, then the nature of the expected weak correlations should be suggested so that work can be more closely targeted.

The choice of *F. rufa* as an experimental system proved to be a sound basis from which to uncover the experimental problems of testing for the existence of real ecosystem entities.

If structures such as the ETM exist, then it is important for ecology that they are found. A number of workers in ecology are currently engaged in research in this area. For example Holt (1996) considers that the linking of spatial ecology with food web ecology warrants more attention than it currently receives. He hopes to define a spatially explicit theory of food webs and has taken top predators as an approach to scaling,

noting its relevance to ETMs. Pahl-Wostl (1993) says of an ETM that "*such a unit at the top is vital to delineate the overall spatial and temporal range of observation*". The discovery of such a unit, if it exists, must await further theoretical developments and further field work.

References

Adams, K. J. (1991) *Some Aspects of the Ecology of* Formica rufa *L. (Hymenoptera: Formicidae) in Blean Woods National Nature Reserve, Kent.* MSc. Thesis. University of Kent, UK.

Adlung, K. G. (1966) A critical evaluation of the European research on use of red wood ants (*Formica rufa* group) for the protection of forests against harmful insects. *Zeitschrift für Angewandte Entomologie* 57: 167-189.

Allaby, M. (1994) *Macmillan Dictionary of the Environment.* 4th ed. London, UK: Macmillan Press Ltd.

Allen, P. M. and McGlade, J. M. (1987) Modelling complex human systems: a fisheries example. *European Journal of Operational Research* 30: 147-167.

Allen, T. F. H. and Hoekstra, T. W. (1992) *Toward a Unified Ecology.* (Complexity in Ecological Systems Series). Series editors Allen, T. F. H. and Roberts, D. W. New York, USA: Columbia University Press.

Auclair, J. L. (1963) Aphid feeding and nutrition. *Annual Review of Entomology* 8: 439-490.

Backus, V. L. and Herbers, J. M. (1992) Sexual allocation ratios in forest ants: food limitation does not explain observed patterns. *Behavioral Ecology and Sociobiology* 30: 425-429.

Baroni Urbani, C. (1979) Territoriality in social insects. In *Social Insects.* Editor Hermann, H. R. pp. 91-120. Vol. 1. London, UK: Academic Press.

Barrett, K. E. J. (1968) A survey of the distribution and present status of the wood ant, *Formica rufa* L. (Hym., Formicidae), in England and Wales. *Transactions of the Society for British Entomology* 17, part VIII: 217-233.

Begon, M., Harper, J. L. and Townsend, C. R. (1986) *Ecology: Individuals, Populations and Communities.* Oxford, UK: Blackwell Scientific Publications.

Bernstein, R. (1975) Foraging strategies of ants in response to variable food density. *Ecology* 56: 213-219.

Bernstein, R. A. and Gobbel, M. (1979) Partitioning of space in communities of ants. *Journal of Animal Ecology* 48: 931-942.

Berryman, A. A. (1993) Food web connectance and feedback dominance, or does everything really depend on everything else ? *Oikos* 68, no. 1: 183-185.

Bhatkar, A. and Whitcomb, W. H. (1970) Artificial diet for rearing various species of ants. *Florida Entomologist* 53, no. 4: 229-232.

Blackman, R. L. and Eastop, V. F. (1994) *Aphids on the World's Trees: an Identification and Information Guide.* Wallingford, UK: CAB International in assocation with The Natural History Museum.

Blanford, S. (1994) *Aspects of the Distribution and Foraging of the Wood Ant (*Formica rufa *Group) at Burnham Beeches National Nature Reserve.* B.Sc. Dissertion, University of Greenwich, UK.

Bonser, R., Wright, P. J., Bament, S. and Chukwu, U. O. (1998) Optimal patch use by foraging workers of *Lasius fuliginosus*, *L. niger* and *Myrmica ruginodis*. *Ecological Entomology* 23, no. 1: 15-21.

Boose, E. R., Boose, E. R. and Lezberg, A. L. (1998) A practical method for mapping trees using distance measurements. *Ecology* 79, no. 3: 819-827.

Breymeyer, A. (1966) Relations between wandering spiders and other epigeic predatory Arthropoda. *Ekologia Polska - Seria A* 14, no. 2: 27-67.

Brian, M. V. Editor. (1978) *Production Ecology of Ants and Termites.* (International Biological Programme, 13). Cambridge, UK: Cambridge University Press.

Brian, M. V. (1979) Caste differentiation and division of labor. In *Social Insects.* Editor Hermann, H. R. pp. 121-222. Vol. 1. London, UK: Academic Press.

Brian, M. V. (1983) *Social Insects: Ecology and Behavioural Biology.* London, UK: Chapman & Hall Ltd.

Briand, F. and Cohen, J. E. (1987) Environmental correlates of food chain length. *Science* 238, 13th November: 956-960.

Brüning, A. (1991) The effect of a single colony of the red wood ant, *Formica polyctena*, on the spider fauna (Araneae) of a beech forest floor. *Oecologia* 86, no. 4: 478-483.

Cammell, M. E., Way, M. J. and Paiva, M. R. (1996) Diversity and structure of ant communities associated associated with oak, pine, eucalyptus and arable habitats in Portugal. *Insectes Sociaux* 43: 37-46.

Carroll, C. R. and Janzen, D. H. (1973) Ecology of foraging ants. *Annual Review of Ecology and Systematics* 4: 231-257.

Charnov, E. L. (1976) Optimal foraging: the marginal value theorem. *Theoretical Population Biology* 9: 129-136.

Chauvin, R. (1966) Un procédé pour rêcolter automatiquement les proies que les *Formica polyctena* rappoertent au nid. *Insectes Sociaux* 13, no. 1: 59-67.

Cherix, D. and Bourne, J. D. (1980) A field study on a super-colony of the red wood ant *Formica lugubris* Zett. in relation to other predatory arthopodes (spiders, harvestmen and ants). *Revue de Suisse Zoologie* 87, no. 4: 955-973.

Chinery, M. (1986) *Collins Guide to the Insects of Britain and Western Europe.* London, UK: Collins.

Clark, P. J. and Evans, F. C. (1954) Distance to nearest neighbour as a measure of spatial relationships in populations. *Ecology* 35, no. 4: 445-453.

Cohen, J. E. Compiler. (1989) *Ecologists' Co-Operative Web Bank. Version 1.0. Machine-Readable Database of Food Webs.* New York, USA: The Rockefeller University.

Cohen, J. E., Beaver, R. A.,Cousins, S. H., DeAngelis, D. L., Goldwasser, L., Heong, K. L., Holt, R. D., Kohn, A. J., Lawton, J. H., Martinez, N. D., O'Malley, R., Page, L. M., Patten, B. C., Pimm, S. L., Polis, G. A., Rejmánek, M. Schoener, T. W., Schoenly, K., Sprules, W. G., Teal, J. M., Ulanowicz, R. E., Warren, P. H., Wilbur, H. M., and Yodzis, P. (1993) Improving food webs. *Ecology* 73, no. 1: 252-258.

Collingwood, C. A. (1979) *The Formicidae (Hymenoptera) of Fennoscandia and Denmark.* (Fauna Entomologica Scandinavica, 8). Klampenborg, Denmark: Scandinavian Science Press Ltd.

Corporation of London. (1993) *The Official Guide to Burnham Beeches.* London, UK: Corporation of London.

Cosens, D. and Toussaint, N. (1985) An experimental study of the foraging strategy of the wood ant *Formica aquilonia. Animal Behaviour* 33: 541-552.

Cotti, G. (1963) *Bibliografia Ragionata 1930 - 1961 del Gruppo* Formica rufa *in Italiano, Deutsch, English.* Roma, Italy: Ministero dell'Agricoltura e delle Foreste.

Cousins, S. H. (1990) Countable ecosystems deriving from a new food web entity. *Oikos* 57, no. 2: 270-275.

Cousins, S. H. (1993) Hierarchy in ecology: its relevance to landscape ecology and geographic information systems. In *Landscape Ecology and Geographic Information Systems.* Editors Haines-Young, R., Green, D. R. and Cousins, S. H. pp. 75-86. London, UK: Taylor & Francis Ltd.

Cousins, S. H. (1994) Taxonomy and functional biotic measurement, or, will the ark work? In *Systematics and Conservation Evaluation.* Editors Forey, P. L., Humphries, C. J. and Vane-Wright, R. I. pp. 397-419. (Systematics Association Special Volume No. 50). Oxford, UK: Clarendon Press.

Cousins, S. H. (1996) Food webs: from the Lindeman paradigm to a taxonomic general theory of ecology. In *Food Webs: Integration of Patterns and Dynamics.* Editors Polis, G. A. and Winemiller, K. O. pp. 243-251. New York, USA: Chapman and Hall.

Cushman, J. H., Martinsen, G. D. and Mazeroll, A. I. (1988) Density- and size-dependent spacing of ant nests: evidence for intraspecific competition. *Oecologia* 77, no. 4: 522-525.

de Bruyn, G. J., Goosen-De Roo, L., Hubregtse-Van Den Berg, A. I. and Feijen, H. R. (1972) Predation of ants by woodpeckers. *Ekologia Polska* 20, no. 9: 83-91.

Del-Claro, K. and Oliveira, P. S. (1993) Ant-Homoptera interaction: do alternative sugar sources distract tending ants? *Oikos* 68: 202-206.

Deslippe, R. J. and Savolainen, R. (1994) Role of food supply in structuring a population of *Formica* ants. *Journal of Animal Ecology* 63: 756-764.

Dobrzańska, J. (1958) Partition of foraging grounds and modes of conveyings [sic] information among ants. *Acta Biologiae Experimentalis* 18: 55-67.

Doncaster, C. P., and Macdonald, D. W. (1991) Drifting territoriality in the red fox *Vulpes vulpes*. *Journal of Animal Ecology* 60: 423-439.

Donisthorpe, H. St. J. K. (1909a) On the colonisation of new nests of ants by myrmecophilous Coleoptera. *Transactions of the Entomological Society of London* , no. 3: 413-429.

Donisthorpe, H. St. J. K. (1909b) On the origin and ancestral form of myrmecophilous Coleopetera. *Transactions of the Entomological Society of London* , no. 3: 397-411.

Donisthorpe, H. St. J. K. (1927) *British Ants: Their Life-History and Classification.* 2nd ed. London, UK: George Routledge and Sons, Ltd.

Edwards, J. P. and Abraham, L. (1990) Changes in food selection by workers of the pharaoh's ant, *Monomorium pharaonis*. *Medical and Veterinary Entomology* 4: 205-211.

Eidmann, H. (1930) Die forstliche Bedeutung der roten Waldameisen. *Mitteilungen aus Forstwirtschaft und Forstwissenschaft* 1: 515-525.

Elton, C. S. (1927) *Animal Ecology*. (Text-Books of Animal Ecology). Series editor. Huxley, J. S. London, UK: Sidgwick and Jackson Ltd.

Elton, C. S. (1932) Territory among wood ants (*Formica rufa* L.) at Picket Hill. *Journal of Animal Ecology* 1: 69-76.

Emlen, J. M. (1966) The role of time and energy in food preference. *American Naturalist* 100: 611-617.

Evans, F. C. (1956) Ecosystem as the basic unit in ecology. *Science* 123: 1127-1128.

Fellers, J. H. (1989) Daily and seasonal activity in woodland ants. *Oecologia* 78: 69-76.

Finnegan, R. J (1969) Assessing predation by ants on insects. *Insectes Sociaux* 16, no. 1: 61-66.

Finnegan, R. J. (1974) Ants as predators of forest pests. *Entomophaga Memoire Hors Serie* 7: 53-59.

Finnegan, R. J (1975) Introduction of a predacious red wood ant, *Formica lugubris* (Hymenoptera: Formicidae), from Italy to Eastern Canada. *Canadian Entomologist* 107: 1271-1274.

Finnegan, R. J (1979) Predacious red wood ants in Quebec forests. In *Comptes Rendues de La Réunion des Groupes de Travail* "Formica rufa" *et "Vertebres Predateurs des Insectes" de l'Oilb, Vareena, Italie, 1978*. Bulletin SROP, no. II-3. pp. 65-73. Organisation Internationale de Lutte Biologique contre les Animaux et les Plantes Nuisibles.

Fowler, C. (1888) *The Coleoptera of the British Islands. Vol. II. Staphylinidae.* London, UK: L. Reeve and Co.

Fowler, S. V. and MacGarvin, M. (1985) The impact of hairy wood ants, *Formica lugubris*, on the guild structure of herbivorous insects on birch, *Betula pubescens*. *Journal of Animal Ecology* 54: 847-855.

Fritts, S. H. and Mech, L. D. (1981) Dynamics, movements, and feeding ecology of a newly protected wolf population in northwestern Minnesota. *Wildlife Monographs*, no. 80: 1-79.

Galle Jr., L. (1976) Adatok a *Formica pratensis* Retz. (Hymenoptera: Formicidae) Anyag - Es Energiaforgalmi Szerepénekismeretéhez Del-Al-Földi Psammohil Ökoszisztémákban. In *Proceedings of the 12th Symposium of the Hungarian Biological Society, Debrecen*. pp. 126-128.

Ghiselin, M. T. (1987) Hierarchies and their components. *Paleobiology* 13, no. 1: 108-111.

Gittleman, J. L. and Harvey, P. H. (1982) Carnivore home-range size, metabolic needs and ecology. *Behavioral Ecology and Sociobiology* 10: 57-63.

Gleason, H. A. (1926) The individualistic concept of the plant association. *Bulletin of the Torrey Botanical Club* 53: 7-26.

Golley, F. B. (1993) *A History of the Ecosystem Concept in Ecology: More Than the Sum of the Parts.* New Haven, USA: Yale University Press.

Gordon, D. M. (1991) Behavioural flexibility and the foraging ecology of seed-eating ants. *American Naturalist* 138: 379-411.

Gordon, D. M. (1995) The development of an ant colony's foraging range. *Animal Behaviour* 49: 649-659.

Gordon, D. M., Rosengren, R. and Sundström, L. (1992) The allocation of foragers in red wood ants. *Ecological Entomology* 17: 114-120.

Gößwald, K. (1958) Neue Einfahrungen über Einwirkung der roten Waldameise auf den Massenwechsel von Schadinsekten sowie einige methodische Verbesserungen bei ihrem praktischen Einsatz. *Proceedings of 10th International Congress of Entomology, Montreal, 1956.* pp. 567-571. Vol. 4.

Gotwald Jr., W. H. (1986) The beneficial economic role of ants. In *Economic Impact and Control of Social Insects.* Editor Bradleigh Vinson, S. pp. 290-313. New York, USA: Praeger Publishers.

Gotwald Jr., W. H. (1995) *Army Ants: the Biology of Social Predation.* (The Cornell Series in Arthropod Biology) Series editor Eickwort, G. C. New York, USA: Cornell University Press.

Grant, S. and Moran, V. C. (1986) The effects of foraging ants on arboreal insect herbivores in an undisturbed woodland savanna. *Ecological Entomology* 11: 83-93.

Greathead, D. J. Editor. (1976) *A Review of Biological Control in Western and Southern Europe.* Technical Communication No. 7. Farnham Royal, UK: Commonwealth Agricultural Bureaux.

Gridina, T. I. (1990) Influence of *Formica polyctena* Foerst. (*Hymenoptera, Formicidae*) on the distribution of predatory arthropods in forest ecosystems. *Memorabilia Zoologica* 44: 21-36.

Haemig, P. D. (1992) Competition between ants and birds in an swedish forest. *Oikos* 65: 479-483.

Hammond, L. (1992) *The Impact of Wood Ants* Formica rufa *L. (Hymenoptera: Formicidae) on Woodland Floor Invertebrates at Burnham Beeches SSSI, Buckinghamshire.* University of Leeds, Department of Pure and Applied Biology, Zoology Summer Field Project Report.

Herbers, J. M. (1989) Community structure in north termperate ants: temporal and spatial variation. *Oecologia* 81, no. 2: 201-211.

Holder Bailey, K. and Polis, G. A. (1987) Optimal and central-place foraging theory applied to a desert harvester ant, *Pogonomyrmex californicus*. *Oecologia* 72: 440-448.

Hölldobler, B. and Wilson, E. O. (1990) *The Ants*. Berlin, Germany: Springer.

Hölldobler, B. and Lumsden, C. J. (1980) Territorial strategies in ants. *Science* 214, 14th November: 732-739.

Holt, R. D. (1996) Food webs in space: an island biogeographic perspective. In *Food Webs: Integration of Patterns and Dynamics.* Editors Polis, G. A. and Winemiller, K. O. pp. 313-323. New York, USA: Chapman and Hall.

Holt, S. J. (1955) On the foraging activity of the wood ant. *Animal Ecology* 24, no. 1: 1-34.

Horn-Mrozowska, E. (1976) Energy budget elements of an experimental nest of *Formica pratensis* Retzius 1783 (*Hymenoptera, Formicidae*). *Polish Ecological Studies* 2, no. 3: 55-98.

Horstmann, K. (1970) Untersuchungen über den Nahrungserwerb der Waldameisen (*Formica polyctena* Förster) im Eichenwald. I. Zusammensetzung der Nahrung, Abhängigkeit von Witterungsfa. *Oecologia* 5: 138-157.

Horstmann, K. (1972) Untersuchungen über den Nahrungserwerb der Waldameisen (*Formica polyctena* Foerster) im Eichenwald. *Oecologia* 8: 371-390.

Imms, A. D. (1970) *A General Textbook of Entomology.* Revisers Richards, O. W. and Davies, R. G. 9th ed. London, UK: Methuen & Co Ltd.

Ito, F. and Higashi, S. (1991) An indirect mutalism between oaks and wood ants via aphids. *Journal of Animal Ecology* 60: 463-470.

Jensen, T. F. (1978) An energy budget for a field population of *Formica pratensis* Retz. (*Hymenoptera: Formicidae*). *Natura Jutlandica* 20: 203-226.

Kacelnik, A. (1993) Leaf-cutting ants tease optimal foraging theorists. *Trends in Ecology and Evolution* 8, no. 10: 346-348.

Kareiva, P. (1994) Space: the final frontier for ecological theory. *Ecology* 75, no. 1: 1.

Klimetzek, D. and Faas, G. (1994) Influence of weather and nest site on the nuptial flight of hill-building wood-ants of the *Formica rufa*-group (Hym., Formicidae). *Journal of Applied Entomology* 117: 508-518.

Krebs, C. J. (1989) *Ecological Methodology.* New York, USA: HarperCollins*Publishers* Inc.

Kruuk, H. (1986) Interactions between felidae and their prey species: a review. In *Cats of the World: Biology, Conservation and Management.* Editors Miller, S. D. and Everett, D. D. pp. 353-374. Washington DC, USA: National Wildlife Federation.

Kruuk, H. and Parish, T. (1982) Factors affecting population density, group size and territory size of the european badger, *Meles meles*. *Journal of Zoology, London* 196: 31-39.

Lawton, J. H. (1989) Food webs. In *Ecological Concepts: the Contribution of Ecology to an Understanding of the Natural World.* Editor Cherrett, J. M. pp. 43-78. London, UK: Blackwell Scientific Publications.

Levings, S. C. and Franks, N. R. (1982) Patterns of nest dispersion in a tropical ground ant community. *Ecology* 63, no. 2: 338-344.

Levings, S. C. and Traniello, J. F. A. (1981) Territoriality, nest dispersion, and community structure in ants. *Psyche* 88: 265-319.

Levins, R. and Lewontin, R. (1980) Dialectics and reductionism in ecology. *Synthese* 43, no. 1: 47-78.

Lindeman, R. L. (1942) The trophic-dynamic aspect of ecology. *Ecology* 23, no. 4: 399-418.

Lofgren, C. S. (1986) History of imported fire ants in the united states. In *Fire Ants and Leaf-Cutting Ants: Biology and Management.* Editors Lofgren, C. S. and Vander Meer, R. K. pp. 36-47. Boulder, USA: Westview Press.

Mabelis, A. A. (1979a) Wood ant wars: the relationship between aggression and predation in the red wood ant (*Formica polyctena* Först.). *Netherlands Journal of Zoology* 29, no. 4: 451-620.

Mabelis, A. A. (1979b) Distribution of red wood ants (*Formica polyctena* Först.) over the foraging area of their nest, and the influence of a conspecific neighbouring population. *Netherlands Journal of Zoology* 29, no. 2: 221-232.

MacArthur, R. H. and Pianka, E. R. (1966) On optimal use of a patchy environment. *American Naturalist* 100: 603-609.

Macdonald, D. W. (1983) The ecology of carnivore social behaviour. *Nature* 301, no. 5899: 379-384.

MacKay, W. P. (1985) A comparison of the energy budgets of three species of *Pogonomyrmex* harvester ants (Hymenoptera: Formicidae). *Oecologia* 66: 484-494.

MacMahon, J. A., Phillips, D. L., Robinson, J. V. and Schimpf, D. J. (1978) Levels of biological organization: an organism-centred approach. *BioScience* 28, no. 11: 700-704.

Mahdi, T. and Whittaker, J. B. (1993) Do birch trees (*Betula pendula*) grow better if foraged by wood ants? *Journal of Animal Ecology* 62: 101-116.

Majer, J. D. (1986) Utilizing economically beneficial ants. In *Economic Impact and Control of Social Insects.* Editor Bradleigh Vinson, S. pp. 314-331. New York, USA: Praeger Publishers.

Majer, J. D. (1994) Spread of Argentine ants (*Linepithema Humile*), with special reference to western Australia. In *Exotic Ants: Biology, Impact, and Control of Introduced Species.* pp. Editor Williams, D. F. Boulder, USA: Westview Press.

McIntosh, R. P. (1980) The background and some current problems of theoretical ecology. *Synthese* 43, no. 2: 195-255.

McIntosh, R. P. (1985) *The Background of Ecology: Concept and Theory.* (Cambridge Studies in Ecology). Cambridge, UK: Cambridge University Press.

McIver, J. D. and Loomis, C. (1993) A size-distance relation in Homoptera-tending thatch ants (*Formica obscuripes, Formica planipilis*). *Insectes Sociaux* 40: 207-218.

Michel, E. (1942) Beiträge zur Kenntnis von *Lachnus (Pterochlorus) roboris* L., einer wichtigen Honigtauerzeugerin an der Eiche. *Zeitschrift für Angewandte Entomologie* 29: 243-281.

Morley, D. W. (1953) *The Ant World.* London, UK: Penguin Books Ltd.

Nielsen, M. G. (1972) An attempt to estimate energy flow through a population of workers of *Lasius aliensus* (Forst.) (Hymenoptera: Formicidae). *Natura Jutlandica* 16: 99-107.

Nielsen, M. G. (1978) Production of sexuals in nests of the ant *Lasius alienus* (Först.) (*Hymenoptera: Formicidae*). *Natura Jutlandica* 20: 251-254.

Nielsen, M. G. and Josens, G. (1978) Production by Ants and Termites. In *Production Ecology of Ants and Termites*. Editor Brian, M. V. pp. 45-53. (International Biological Programme, 13). Cambridge, UK: Cambridge University Press.

Niemelä, P. and Laine, K. J. (1986) Green islands - predation and nutrition. *Oecologia* 68: 476-478.

North, R. D. (1993) The effects of light and temperature on the foraging activity of wood ants, *Formica rufa* (L.) (Hymenoptera: Formicidae), inhabiting a woodland in southern England. *Entomologists's Gazette* 44, no. 1: 57-66.

Økland, F. (1932) Kvantitative undersøkelser av den Røde Skogmaurs Ernaering. *Naturen* 56: 247-252.

Økland, F. (1930) Wievel "Blattlauszucker" verbraucht die rote Waldameise (*Formica rufa* L.)? *Biologische Zentralblatt* 50: 449-459.

Orians, G. H. and Pearson, N. E. (1979) On the theory of central place foraging. In *Analysis of Ecological Systems*. Editors Horn, D. J., Stairs, G. R. and Mitchell, R. D. pp. 155-177. Columbus, USA: Ohio State Univeristy Press.

Oster, G. F. and Wilson, E. O. (1978) *Caste and Ecology in the Social Insects*. (Monographs in Population Biology, 12). Princeton, USA: Princeton University Press.

Pahl-Wostl, C. (1993) Food webs and ecological networks across temporal and spatial scales. *Oikos* 67, no. 3: 415-432.

Pahl-Wostl, C. (1995) *The Dynamic Nature of Ecosystems: Chaos and Order Entwined*. Chichester, UK: John Wiley & Sons.

Paine, R. T. (1988) Food webs - road maps of interactions or grist for theoretical development. *Ecology* 69, no. 6: 1648-1654.

Pasteels, J. M., Deneubourg, J.-L. and Goss, S. (1987) Self-organization mechanisms in ant societies (I): trail recruitment to newly discovered food sources. In *From Individual to Collective Behaviour in Social Insects: Les Treilles Workshop*. Editors Pasteels, J. M. and Deneubourg, J.-L. pp. 155-175. (Experientia Supplementum, 54.) Basel, Switzerland: Birkhäuser Verlag.

Patten, B. C. (1982) Environs: relativistic elementary particles for ecology. *The American Naturalist* 119, no. 2: 179-219.

Paulson, G. S. and Akre, R. D. (1992) Evaluating the effectiveness of ants as biological control agents of pear psylla (Homoptera: Psyllidae). *Journal of Economic Entomology* 85, no. 1: 70-73.

Pavan, M. (1951) Primi risultati di un esperimento pratico di lotta biologica con *Formica rufa* L. contro processionaria del pino (*Thaumetopoea pityocampa* Schiff.). *Atti Della Società Italiana Di Scienze Naturali* 90: 1-12.

Peakin, G. J. and Josens, G. (1978) Respiration and energy flow. In *Production Ecology of Ants and Termites*. Editor Brian, M. V. pp. 111-63. (International Biological Programme, 13). Cambridge, UK: Cambridge University Press.

Perry, G. and Pianka, E. R. (1997) Animal foraging: past, present and future. *Trends in Ecology and Evolution* 12, no. 9: 360-364.

Pętal, J. and Breymeyer, A. (1969) Reduction of wandering spiders by ants in a Stellario-Deschampsietum meadow. *Bulletin de l'Académie Polonaise des Sciences* 17, no. 4: 239-244.

Peterson, R. O., Woolington, J. D. and Bailey, T. N. (1984) Wolves of the Kenai Peninsula, Alaska. *Wildlife Monographs* , no. 88: 1-52.

Pimm, S. L. (1982) *Food Webs*. London, UK: Chapman and Hall.

Pimm, S. L. and Lawton, J. H. (1980) Are food webs divided into compartments? *Journal of Animal Ecology* 49: 879-898.

Pimm, S. L. and Rice, J. C. (1987) The dynamics of multispecies, multilife-stage models of aquatic food webs. *Theoretical Population Biology* 32, no. 3: 303-325.

Polis, G. A. (1991) Complex trophic interactions in deserts: an empirical critique of food-web theory. *American Naturalist* 138, no. 1: 123-155.

Pomeroy, L. R., Hargrove, E. C. and Alberts, J. J. (1988) The ecosystem perspective. In *Concepts of Ecosystem Ecology: a Comparative View*. Editors Pomeroy, L. R. and Alberts, J. J. pp. 1-17. (Ecological Studies, 67). New York, USA: Springer.

Pontin, A. J. (1969) Experimental transplantation of nest-mounds of the ant *Lasius flavus* (F.) in a habitat containing also *L. niger* (L.) and *Myrmica scabrinodis* Nyl. *Journal of Animal Ecology* 38: 747-754.

Pontin, A. J. (1961) Population stabilization and competition between the ants *Lasius flavus* (F.) and *L. niger* (L.). *Journal of Animal Ecology* 30: 47-54.

Reiners, W. A. (1986) Complementary models for ecosystems. *The American Naturalist* 127, no. 1: 59-73.

Ricklefs, R. E. (1987) Structure in ecology. *Science* 236, 10th April: 206-207.

Risch, S. J. and Carroll, C. R. (1982) The ecological role of ants in two Mexican agroecosystems. *Oecologia* 55: 114-119.

Rosengren, R. (1971) Route fidelity, visual memory and recruitment behaviour in foraging wood ants of the genus *Formica* (Hymenoptera: Formicidae). *Acta Zoologica Fennica* 133: 1-106.

Rosengren, R. (1977) Foraging strategy of wood ants (*Formica rufa* group). I. Age polyethism and tographic traditions. *Acta Zoologica Fennica* 149: 1-30.

Rosengren, R. and Fortelius, W. (1986) Ortstreue in foraging ants of the *Formica rufa* group - hierarchy of orienting cues and long-term memory. *Insectes Sociaux* 33, no. 3: 306-337.

Rosengren, R. and Fortelius,W. (1987) Trail communication and directional recruitment to food in red wood ants (*Formica*). *Annales Zoologica Fennici* 24: 137-146.

Rosengren, R. and Sundström, L. (1987) The foraging system of a red wood ant colony (*Formica* s. str.) - collecting and defending food through an extended phenotype. In *From Individual to Collective Behaviour in Social Insects: Les Treilles Workshop.* Editors Pasteels, J.-L. and Deneubourg, J.-L. pp. 117-37. (Experientia Supplementum, 54). Basel, Switzerland: Birkhäuser Verlag.

Rosengren, R. and Sundström, L. (1991) The interaction between red wood ants, *Cinara* aphids, and pines. a ghost of mutalism past? In *Ant-Plant Interactions.* Editors Huxley, C. R. and Cutler, D. F. pp. 80-91. Oxford, UK: Oxford University Press.

Rosengren, R., Vepsäläinen, K. and Wuorenrinne, H. (1979) Distribution, nest densities, and ecological significance of wood ants (the *Formica rufa* group) in Finland. In *Comptes Rendues de la Réunion des Groupes De Travail* "Formica rufa" *et "Vertebres Predateurs des Insectes" de l'Oilb, Vareena, Italie, 1978.* Bulletin SROP, no. II-3. Organisation Internationale de Lutte Biologique Contre les Animaux et les Plantes Nuisibles.

Ryti, R. T. (1991) Theoretical considerations of density-dependent spacing of a mound-building ant (*Formica altipetens*). *Journal of Theoretical Biology* 147: 289-301.

Ryti, R. T, and Case, T. J. (1988) Field experiments on desert ants: testing for competition between colonies . *Ecology* 69, no. 6: 1993-2003.

Ryti, R. T, and Case, T. J. (1986) Overdispersion of ant colonies: a test hypothesis. *Oecologia* 69: 446-453.

Salthe, S. N. (1985) *Evolving Hierarchical Systems: Their Structure and Representation*. New York, USA: Columbia University Press.

Samways, M. J. (1983) Community structure of ants (Hymenoptera, Formicidae) in a series of habitats associated with citrus. *Journal of Applied Ecology* 20: 833-847.

Saunders, G., White, P. C. L., Harris, S. and Rayner, J. M. V. (1993) Urban foxes (*Vulpes vulpes*): food acquisition, time and energy budgeting of a generalized predator. In *Mammals As Predators: The Proceedings of a Symposium Held by the Zoological Society of London and the Mammal Society*. Editors Dunstone, N. and Gorman, M. L. pp. 215-234. New York, USA: Oxford University Press.

Savolainen, R. (1990) Colony success of the submissive ant *formica fusca* within territories of the dominant *Formica polyctena*. *Ecological Entomology* 15: 79-85.

Savolainen, R. and Vepsäläinen, K. (1988) A competition hierarchy among boreal ants: impact on resource partitioning and community structure. *Oikos* 51: 135-155.

Savolainen, R., Vepsäläinen, K. and Wuorenrinne, H. (1989) Ant assemblages in the taiga biome: testing the role of territorial wood ants. *Oecologia* 81, no. 4: 481-486.

Schmutterer, H. (1956) Saugschäden an Eichen und Buchen durch Lachniden in Abhängigheit von Ameisen-Trophobiose. *Zeitschrift für Angewandte Entomologie* 39: 178-185.

Schoener, T. W. (1979) Generality of the size-distance relation in models of optimal feeding. *American Naturalist* 114: 902-914.

Schoener, T. W. (1971) Theory of feeding strategies. *Annual Review of Ecology and Systematics* 2: 369-404.

Schoenly, K. and Cohen, J. E. (1991) Temporal variation in food web structure - 16 empirical cases. *Ecological Monographs* 61, no. 3: 267-298.

Schwenke, W. (1957) Über die räuberische Tätigkeit von *Formica rufa* L. and *F. nigricans* Emery außerhalb einer Insektenmassenvermehrung. *Beitrage Zur Entomologie* 7, no. 3/4: 226-246.

Siegel, A. F. and Morgan, C. J. (1996) *Statistics and Data Analysis: an Introduction*. New York, USA: John Wiley & Sons, Inc.

Siegel, S. (1956) *Nonparametric Statistics for the Behavioural Sciences*. (McGraw-Hill Series in Psychology). New York, USA: McGraw-Hill Book Company, Inc.

Simberloff, D. (1979) Nearest neighbour assessments of spatial configurations of circles rather than points. *Ecology* 60, no. 4: 679-685.

Simberloff, D. (1980) A succession of paradigms in ecology: essentialism to materialism and probabilism. *Synthese* 43, no. 1: 3-39.

Skinner, G. J. (1976) *Some Aspects of the Ecology of the Wood Ant,* Formica rufa *L. (Hymenoptera: Formicidae), in Limestone Woodlands of North-West England.* Ph.D. Thesis. University of Lancaster, UK.

Skinner, G. J. (1980a) The feeding habits of the wood-ant, *Formica rufa* (Hymenoptera: Formicidae), in limestone woodland in north-west England. *Journal of Animal Ecology* 49: 417-433.

Skinner, G. J. (1980b) Territory, trail structure and activity patterns in the wood-ant, *Formica rufa* (Hymenoptera: Formicidae) in limestone woodland in north-west England. *Journal of Animal Ecology* 49: 381-394.

Skinner, G. J. and Whittaker, J. B. (1981) An experimental investigation of inter-relationships between the wood-ant (*Formica rufa*) and some tree-canopy herbivores. *Journal of Animal Ecology* 50: 313-326.

Southwood, T. R. E. (1961) The number of species of insect associated with various trees. *Journal of Animal Ecology* 30: 1-8.

Southwood, T. R. E. (1978) *Ecological Methods: With Particular Reference to the Study of Insect Populations*. 2nd ed. London, UK: Chapman & Hall.

Stephens, D. W. and Krebs, J. R. (1986) *Foraging Theory.* (Monographs in Behavior and Ecology). Princeton, USA: Princeton University Press.

Stevens, H. (1995) *The Territory Size, Foraging Behaviour and Rate of Activity in the Ant Species* Formica rufa *in Burnham Beeches, Buckinghamshire.* A Report in Partial Fulfilment of the Requirements for the Award of BSc. (Hons) Life Science With Education.

Stewart, I. and Cohen, J. (1994) Why are there simple rules in a complicated universe? *Futures* 26, no. 6: 648-664.

Stradling, D. J. (1978) Food and feeding habits of ants. In *Production Ecology of Ants and Termites*. Editor Brian, M. V. pp. 81-106. (International Biological Programme, 13). Cambridge, UK: Cambridge University Press.

Stumper, R. (1923) Études sur les fourmis. VI. - sur l'utilité de la fourmi des bois (*Formica rufa* L.). *Bulletin de la Société Entomologique de Belgique* 5, no. 1-2: 38-39.

Sudd, J. H. (1983) The distribution of foraging wood-ants (F*ormica lugubris* Zett.) in relation to the distribution of aphids. *Insectes Sociaux* 30, no. 3: 298-307.

Sudd, J. H. (1987) Individual behaviour and mixed diet strategy. In *From Individual to Collective Behaviour in Social Insects. Les Treilles Workshop.* Editors Pasteels, J M and Deneubourg, J.-L. pp. 81-92. (Experientia Supplementum, 54). Basel, Switzerland: Birkhäuser Verlag.

Sudd, J. H. and Lodhi, Q. K. (1981) The distribution of foraging workers of the wood-ant *Formica lugubris* Zetterstedt (Hymneoptera: Formicidae) and their effect on the numbers and diversity of other Arthropoda. *Biological Conservation* 20: 133-145.

Sudd, J. H. and Sudd, M. E. (1985) Seasonal changes in the response of wood-ants (*Formica Lugubris*) to sucrose baits. *Ecological Entomology* 10: 89-97.

Sundström, L. (1993) Foraging responses of *Formica truncorum* (Hymenoptera; Formicidae); exploiting stable vs spatially and temporally variable resources. *Insectes Sociaux* 40, no. 2: 147-161.

Tansley, A. G. (1935) The use and abuse of vegetational concepts and terms. *Ecology* 16, no. 3: 284-307.

Tingle, C. C. D. (1993) Bait location by ground foraging ants (Hymenoptera: Formicidae) in mopane woodland selectively sprayed to control tsetse fly (Diptera: Glossinidae) in Zimbabwe). *Bulletin of Entomological Research* 83: 259-265.

Traniello, J. F. A. (1987) Social and individual responses to environmental factors in ants. In *From Individual to Collective Behaviour in Social Insects: Les Treilles Workshop*. Editors Pasteels, J. M.and Deneubourg, J.-L. pp. 63-79. (Experientia Supplementum, 54). Basel, Switzerland: Birkhäuser Verlag.

Traniello, J. F. A. (1989) Foraging strategies of ants. *Annual Review of Entomology* 34: 191-210.

Traniello, J. F. A. and Levings, S. C. (1986) Intra- and intercolony patterns of nest dispersion in the ant *Lasius neoniger*: correlations with territorality and foraging ecology. *Oecologia* 69: 413-419.

van der Aart, P. J. M. and de Wit, T. (1971) A field study on interspecific competition between ants (Formicidae) and hunting spiders (Lycosidae, Gnashosidae, Ctenidae, Pisauridae, Clubionidae). *Netherlands Journal of Zoology* 21, no. 1: 117-126.

Vowles, D. M. (19550 The foraging of ants. *British Journal of Animal Behaviour* 3: 1-13.

Warrington, S. and Whittaker, J. B. (1985) An experimental field study of different levels of insect herbivory induced by *Formica rufa* predation on sycamore (*Acer pseudoplatanus*) II. Aphidoidea. *Journal of Applied Ecology* 22: 787-796.

Way, M. J. (1963) Mutualism between ants and honeydew-producing Homoptera. *Annual Review of Entomology* 8: 307-344.

Way, M. J. and Khoo, K. C. (1992) Role of ants in pest management. *Annual Review of Entomology* 37: 479-503.

Webster, J. R. (1979) Hierarchical organization of ecosystems. In *Theoretical Systems Ecology: Advances and Case Studies.* Editor Halfon, E. pp. 119-29. London, UK: Academic Press.

Welch, R. C. (1978) Changes in the distribution of nests of *Formica rufa* L. (Hymenoptera: Formicidae) At Blean Woods National Nature Reserve, Kent during the decade following coppicing. *Insectes Sociaux* 25, no. 2: 173-186.

Wellenstein, G. (1952) Zur Ernährungsbiologie der roten Waldameise (*Formica rufa* L.). *Zeitschrift für Pflanzenkranheiten Pflanzenpathologie und Pflanzenschutz* 59: 430-451.

Weseloh, R. M. (1994) Spatial distribution of the ants *Formica subsericea, F. neogagates*, and *Aphaenogaster fulva* (Hymenoptera: Formicidae) in Connecticut. *Environmental Entomology* 23, no. 5: 1165-1170.

Weseloh, R. M. (1995) Ant traffic on different tree species in Connecticut. *Canadian Entomologist* 127, no. 4: 569-575.

Weseloh, R. M. (1996) Effect of supplemental foods on foraging behaviour of forest ants in Connecticut. *Environmental Entomology* 25, no. 4: 848-852.

Whittaker, J. B. (1991) Effects of ants on temperate woodland trees. In *Ant-Plant Interactions.* Editors Huxley, C. R. and Cutler, D. F. pp. 67-171. Oxford, UK: Oxford University Press.

Whittaker, J. B. and Warrington, S. (1985) An experimental field study of different levels of insect herbivory induced by *Formica rufa* predation on sycamore (*Acer pseudoplatanus*) III. Effects on Tree Growth. *Journal of Applied Ecology* 22: 797-811.

Wilson, E. O. (1971) *The Insect Societies.* Cambridge, USA: The Belknap Press of Harvard University Press.

Woodroffe, R. and Macdonald, D. W. (1993) Badger sociality - models of spatial groupings. In *Mammals As Predators: The Proceedings of a Symposium Held by the Zoological Society of London and the Mammal Society.* Editors Dunstone, N. and Gorman, M. L. pp. 145-69. New York, USA: Oxford University Press.

Yasuno, M. (1965) Territory of ants in the Kayano grassland at Mt. Hakkoda. *Scientific Report of the Tôhoku University Series IV (Biol.)* 31: 195-206.

Zoebelein, G. (1956) Der Honigtau als Nahrung der Insekten. Teil II. *Zeitschrift für Angewandte Entomologie* 39, no. 2: 129-167.

Appendix A: Sugar bait transects at Dimsdale and Halse for 1994 to 1996

Transect between nests 10D and 2D at Dimsdale

Date	12/04/94	20/04/94	06/05/94	01/06/94	08/06/94	22/06/94	06/07/94	20/07/94	27/07/94	03/08/94
Time	11:10	12:05	14:50	11:55	14:15	13:35	14:20	13:40	14:00	14:00
10	1	50	50	6	4	10	1	8	1	0
20	1	1	40	0	1	7	0	1	2	0
30	1	0	80	1	2	6	0	0	4	2
40	1	0	60	1	1	4	1	0	0	1
50	2	0	15	2	1	0	0	0	0	0
60	0	0	40	0	4	2	0	1	3	1
70	1	1	70	4	2	6	1	0	3	0
80	8	30	60	1	2	8	8	1	3	0
90	8	4	120	4	0	0	1	4	7	0
100	2	1	100	2	10	3	0	1	1	1
110	1	5	100	6	6	15	5	4	3	1
120	2	30	50	2	8	6	5	10	1	0
130	120	100	80	4	8	30	15	10	8	10
140	5	5	100	3	1	20	2	3	5	0
150	4	2	80	1	10	10	3	6	2	2
160	0	0	50	3	0	7	0	0	3	1
170	1	0	50	3	5	3	0	1	0	0
180	0	0	60	3	0	5	2	0	2	0
190	0	1	30	1	0	8	1	0	1	0
200	2	1	60	2	1	1	0	0	2	0

Date	10/08/94	24/08/94	31/08/94	07/09/94	14/09/94	21/09/94	28/09/94	05/10/94	12/10/94	19/10/94
Time	15:00	13:00	12:40	15:30	14:15	14:25	13:20	14:00	14:50	12:55
10	4	2	1	1	1	10	5	30	0	0
20	0	0	0	0	0	2	2	1	0	1
30	0	0	0	1	0	3	0	6	0	0
40	0	1	0	0	1	4	0	0	0	0
50	0	1	0	1	0	0	0	1	0	0
60	1	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	4	6	0	0
80	1	1	0	0	0	5	0	1	0	0
90	1	0	1	0	0	3	1	2	1	1
100	0	0	0	1	0	2	1	8	0	0
110	0	0	0	3	2	2	7	10	0	1
120	0	0	0	4	1	7	2	5	1	0
130	15	1	0	0	10	10	20	40	3	5
140	4	10	0	1	1	20	4	6	1	2
150	0	1	0	1	2	5	3	12	0	0
160	0	0	0	1	0	5	0	1	0	2
170	0	0	0	0	0	1	3	0	1	0
180	0	0	0	0	2	1	0	4	0	0
190	1	1	0	1	1	1	1	10	0	0
200	0	0	0	0	0	0	1	1	0	0

Date	26/10/94	02/11/94	10/11/94	23/11/94	09/12/94	04/01/95	08/02/95	22/02/95	08/03/95	22/03/95
Time	15:00	13:50	15:00	14:30	15:20	15:25	14:45	12:45	14:25	14:40
10	10	30	3	2	0	0	0	2	0	40
20	0	3	0	0	0	0	0	0	0	4
30	0	0	0	0	0	0	0	0	0	1
40	0	0	0	0	0	0	0	0	1	1
50	0	0	1	1	0	0	0	0	0	0
60	1	0	0	0	0	0	0	0	0	0
70	0	2	0	0	0	0	0	0	0	20
80	4	0	0	0	0	0	0	0	0	100
90	1	4	0	3	0	0	0	0	2	100
100	1	2	0	0	0	0	0	0	1	120
110	3	2	0	20	0	0	0	1	3	100
120	10	5	0	80	0	0	0	100	100	100
130	6	70	1	120	0	0	0	1	9	100
140	1	15	15	1	0	0	0	0	1	120
150	1	2	1	0	0	0	0	0	0	120
160	1	1	1	0	1	0	0	1	0	0
170	1	0	1	5	0	0	0	0	0	4
180	0	2	0	0	0	0	0	0	1	1
190	0	0	0	0	0	0	0	0	0	2
200	1	0	0	0	0	0	0	0	0	1

Date	05/04/95	20/04/95	03/05/95	10/05/95	18/05/95	24/05/95	31/05/95	08/06/95	13/06/95	21/06/95
Time	16:10	15:15	12:30	14:35	14:30	12:45	13.45	14:45	15:20	15:15
10	10	100	1	6	100	1	0	3	1	2
20	40	120	0	2	30	0	0	1	1	3
30	100	120	5	0	6	0	0	1	0	1
40	70	100	5	0	2	0	0	0	0	3
50	70	100	5	1	1	0	0	0	0	3
60	10	120	3	2	10	0	0	0	1	2
70	10	120	2	2	30	0	0	0	2	6
80	10	120	25	4	50	0	0	4	3	4
90	10	100	5	0	80	1	0	3	1	3
100	10	120	10	3	25	1	0	4	3	0
110	10	120	70	8	50	1	3	8	4	1
120	5	100	40	5	80	0	2	2	4	6
130	5	100	60	20	100	0	3	20	4	3
140	10	110	50	10	25	1	4	7	1	2
150	15	120	30	1	15	0	4	7	2	1
160	10	120	5	5	10	0	0	1	1	4
170	10	120	20	1	1	0	1	1	0	1
180	5	10	20	3	0	1	0	1	1	3
190	5	90	10	0	0	0	0	0	2	0
200	15	90	15	0	0	0	0	0	0	0

Date	28/06/95	05/07/95	12/07/95	19/07/95	03/08/95	09/08/95	16/08/95	23/08/95	30/08/95	13/09/95
Time	12:30	11:50	12:25	12:45	14:20	11:35	11:50	14:45	12:35	13:40
10	/	15	6	80	70	4	0	0	2	7
20	5	15	3	30	50	1	2	0	1	2
30	/	4	1	10	30	0	1	0	0	1
40	2	2	0	0	7	0	1	0	0	0
50	/	1	0	2	10	0	0	0	0	0
60	0	4	0	0	90	20	1	0	5	3
70	/	1	3	0	40	10	1	0	0	7
80	3	3	5	25	60	10	3	1	3	2
90	/	5	1	20	2	15	0	1	1	5
100	2	0	4	3	5	1	1	0	2	1
110	/	10	20	25	15	40	3	1	4	10
120	10	10	1	35	90	20	5	0	1	1
130	/	4	5	30	110	60	2	1	2	8
140	10	0	5	30	60	20	1	0	1	4
150	/	4	2	10	60	3	0	0	1	1
160	1	3	2	15	90	50	0	1	2	2
170	/	2	4	2	70	1	1	0	0	0
180	/	1	0	25	0	5	0	0	1	0
190	/	2	0	2	40	30	0	0	0	0
200	/	0	3	4	0	1	0	0	0	0

Date	20/09/95	27/09/95	11/10/95	18/10/95	25/10/95	01/11/95	08/11/95	15/11/95	22/11/95	29/11/95
Time	14:15	12:30	15:05	15:20	15:40	14:30	13:25	14:05	13:50	15:15
10	3	5	3	5	10	20	30	3	0	0
20	1	4	0	3	4	6	5	0	0	0
30	0	2	0	1	5	0	0	0	0	0
40	0	0	0	0	0	0	1	0	1	0
50	0	0	0	3	1	2	2	0	0	0
60	3	3	3	1	3	6	1	0	0	0
70	4	0	10	10	2	1	1	0	0	0
80	1	0	0	1	2	4	0	0	0	1
90	3	1	2	5	5	10	70	0	10	10
100	1	1	2	5	6	5	1	1	0	0
110	1	3	3	0	20	10	20	1	0	1
120	5	5	40	60	40	50	120	6	100	60
130	3	5	10	20	15	40	110	10	40	60
140	0	3	2	20	10	7	30	1	5	5
150	0	0	15	2	4	2	0	0	0	0
160	1	5	0	0	3	7	1	0	1	1
170	0	1	0	2	0	0	0	0	0	0
180	0	3	1	0	0	3	2	0	0	0
190	0	0	0	2	3	2	3	0	0	0
200	0	2	1	2	2	0	1	0	0	0

Date	17/01/96	31/01/96	14/02/96	28/02/96	13/03/96	27/03/96	03/04/96	17/04/96	01/05/96	15/05/96
Time	13:45	14:10	13:30	12:35	14:45	13:45	15:50	14:05	15:15	13:15
10	0	0	0	2	0	1	120	100	30	50
20	0	0	0	0	0	0	1	100	20	30
30	0	0	0	0	0	0	1	60	4	80
40	0	0	0	0	0	0	1	3	0	30
50	0	0	0	0	0	0	0	20	5	90
60	0	0	0	0	0	0	0	40	3	100
70	0	0	0	0	0	0	2	120	20	100
80	0	0	0	0	0	0	10	120	6	15
90	1	0	1	2	0	20	100	120	10	30
100	0	0	0	0	0	2	120	90	1	80
110	0	0	0	0	0	5	120	/	10	100
120	0	0	1	2	0	120	120	100	110	5
130	0	0	0	2	0	25	100	120	110	30
140	0	0	0	0	0	4	110	120	110	50
150	0	0	0	0	0	1	90	100	30	15
160	0	0	0	0	0	2	90	30	50	5
170	0	0	0	0	0	0	2	100	10	20
180	0	0	0	0	0	0	0	30	5	10
190	0	0	0	0	0	0	0	10	5	25
200	0	0	0	0	0	0	0	2	0	40

Date	02/06/96	24/06/96
Time	16:45	12:25
10	3	2
20	5	0
30	2	2
40	1	0
50	5	3
60	5	3
70	5	5
80	0	5
90	0	5
100	3	1
110	2	30
120	5	10
130	5	20
140	5	4
150	0	5
160	3	3
170	3	5
180	5	1
190	10	3
200	4	2

Transect between nests 9H and 7D at Halse

Date	26/04/94	06/05/94	18/05/94	03/06/94	15/06/94	29/06/94	13/07/94	20/07/94	27/07/94	03/08/94
Time	12:10	16:25	13:40	14:05	14.15	16:15	13:55	13:45	14:10	14:15
10	60	70	110	3	10	2	4	1	3	0
20	5	60	2	10	15	1	0	0	1	0
30	40	100	8	2	20	0	0	1	0	1
40	100	80	10	4	40	0	4	0	2	1
50	100	70	5	2	30	2	2	0	0	0
60	100	100	50	3	25	1	1	0	2	0
70	100	90	2	1	30	1	0	0	1	0
80	100	60	2	1	40	0	2	0	1	0
90	1	/	5	1	25	3	0	0	2	1
100	120	25	1	2	3	1	1	4	1	1
110	80	30	3	2	10	0	2	10	1	0
120	60	100	20	5	50	2	1	0	0	2
130	50	70	8	3	30	5	3	0	1	2
140	3	20	0	0	15	0	1	1	5	0
150	25	60	0	6	40	1	5	0	0	7
160	10	40	1	3	5	0	2	1	0	1
170	20	6	15	1	20	/	1	0	4	3
180	100	10	5	1	30	4	1	1	0	2
190	1	3	0	0	20	40	0	2	0	3
200	0	100	70	7	60	5	4	10	4	10

Date	10/08/94	24/08/95	31/08/94	07/09/94	14/09/94	21/09/94	28/09/94	05/10/94	12/10/94	19/10/94
Time	15:15	12:30	12:50	15:45	14:10	14:40	13:35	13:45	14:40	13:05
10	3	1	0	1	1	4	3	6	0	12
20	0	0	0	0	1	0	0	10	0	0
30	0	0	0	1	0	0	1	0	0	0
40	0	0	0	0	1	0	0	0	1	0
50	0	0	0	0	0	0	1	0	0	0
60	0	0	0	0	0	1	0	0	0	0
70	0	0	0	0	0	1	0	0	0	0
80	0	0	0	0	1	0	0	2	0	0
90	0	0	0	0	0	1	0	3	0	1
100	4	0	0	0	0	0	0	6	0	0
110	0	0	1	0	0	4	1	10	0	1
120	0	1	0	0	1	1	0	5	0	0
130	2	1	0	2	5	3	4	4	0	0
140	0	0	0	0	0	1	1	0	0	0
150	2	0	0	1	0	2	0	5	0	0
160	1	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0
180	0	0	0	1	0	3	0	1	0	0
190	0	1	0	2	2	3	0	15	0	0
200	10	7	12	3	10	30	15	70	10	25

Date	26/10/94	02/11/94	10/11/94	23/11/94	09/12/94	04/01/95	08/02/95	22/02/95	08/03/95	22/03/95
Time	14:50	13:30	15:15	14:40	15:10	15:15	14:55	12:30	14:10	14:25
10	3	8	1	7	0	0	0	1	1	50
20	4	2	6	6	0	0	0	1	0	120
30	1	0	0	0	0	0	0	0	0	1
40	0	0	0	0	0	0	0	0	0	1
50	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0
70	1	0	0	0	0	0	0	0	0	1
80	0	0	0	0	0	0	0	0	0	1
90	1	0	0	0	0	0	0	0	0	2
100	2	5	0	0	0	0	0	1	0	100
110	3	0	30	1	0	0	0	0	0	120
120	0	0	0	0	0	0	0	2	0	100
130	3	0	0	1	0	0	0	0	0	20
140	0	0	0	0	0	0	0	0	0	2
150	0	1	2	0	0	0	0	0	0	0
160	1	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0
180	7	10	5	1	1	0	0	1	0	120
190	15	10	1	25	0	0	0	2	4	120
200	50	80	100	120	3	0	0	3	3	90

Date	05/04/95	20/04/95	03/05/95	10/05/95	18/05/95	24/05/95	31/05/95	08/06/95	13/06/95	21/06/95
Time	16:00	15:10	12:15	16:00	14:40	13:00	14:00	14:35	15:10	15:00
10	10	10	40	10	30	1	2	5	5	3
20	3	100	40	20	110	1	4	20	2	3
30	10	120	5	3	25	1	0	2	2	7
40	20	120	10	1	15	0	1	4	1	4
50	40	40	5	0	0	0	0	1	1	1
60	30	100	5	2	0	0	0	0	1	2
70	50	40	1	2	0	1	0	0	0	0
80	50	110	2	0	2	0	1	0	1	1
90	50	110	2	0	1	0	0	1	1	2
100	10	110	10	1	50	0	0	3	5	15
110	10	120	30	5	60	2	2	4	4	10
120	10	90	40	4	90	0	0	4	2	10
130	20	120	/	2	20	0	0	5	3	0
140	70	/	40	5	20	0	1	4	2	6
150	10	120	70	3	5	0	0	3	2	2
160	70	110	/	1	1	0	0	1	0	0
170	80	100	10	0	1	0	0	0	0	1
180	10	120	10	0	30	0	0	1	0	0
190	50	120	20	20	100	1	0	2	1	5
200	10	120	10	30	110	2	1	3	5	10

Date	28/06/95	05/07/95	12/07/95	19/07/95	26/07/95	03/08/95	09/08/95	16/08/95	23/08/95	30/08/95
Time	12:40	11:40	12:15	13:00	13:05	14:05	11:45	12:00	15:20	12:45
10	0	5	5	100	2	1	40	3	4	1
20	3	7	1	80	15	100	90	0	3	0
30	5	2	1	/	2	5	40	0	0	1
40	0	0	3	30	8	5	5	2	1	1
50	1	0	0	40	3	6	4	0	0	0
60	0	0	0	20	10	25	3	2	0	0
70	0	0	0	10	25	50	0	0	0	1
80	0	1	1	7	30	100	2	0	0	0
90	4	3	0	5	20	110	2	0	1	0
100	10	10	3	40	20	110	40	1	1	2
110	10	20	5	100	100	120	100	5	0	1
120	2	1	1	80	70	120	120	0	1	1
130	3	0	1	30	60	110	25	3	1	3
140	2	1	1	30	50	90	3	0	0	0
150	2	1	1	20	80	100	1	0	1	0
160	3	1	0	5	50	100	1	0	0	0
170	1	2	0	10	80	100	20	1	0	0
180	1	0	0	2	100	120	110	5	1	1
190	5	2	2	5	100	100	120	10	6	5
200	10	4	7	50	100	110	110	40	10	25

Date	13/09/95	20/09/95	27/09/95	11/10/95	18/10/95	25/10/95	01/11/95	08/11/95	15/11/95	22/11/95
Time	13:50	14:25	12:00	14:50	15:10	15:30	14:45	13:10	14:15	14:00
10	6	3	1	5	10	15	5	5	15	120
20	4	3	1	2	5	15	15	60	20	60
30	0	0	2	1	0	0	0	1	1	0
40	0	1	0	1	0	1	2	3	2	0
50	1	0	0	1	0	0	0	0	0	0
60	0	0	0	1	0	0	0	0	0	0
70	0	0	0	0	0	3	0	0	0	0
80	0	/	1	0	0	3	2	0	0	1
90	1	2	0	1	0	0	1	1	0	0
100	2	0	1	0	15	25	4	3	3	5
110	2	1	7	1	1	30	10	0	50	70
120	1	2	0	1	0	7	5	3	0	0
130	0	0	4	0	0	4	2	4	0	0
140	1	0	0	0	2	1	0	4	0	0
150	0	0	0	0	0	0	1	0	0	0
160	0	0	0	0	1	0	0	0	0	0
170	0	0	0	0	0	0	3	0	0	0
180	0	0	0	0	0	0	0	0	0	2
190	20	3	3	2	3	10	5	3	2	60
200	20	15	6	6	10	30	40	30	80	80

Date	29/11/95	10/01/96	17/01/96	31/01/96	14/02/96	28/02/96	13/03/96	27/03/96	03/04/96	17/04/96
Time	15:00	11:55	13:55	14:00	13:20	12:25	14:40	13:55	15:45	14:00
10	120	0	5	0	0	0	0	100	90	100
20	50	0	3	1	0	0	0	/	90	100
30	0	0	0	0	0	0	0	0	0	120
40	1	0	0	0	0	0	0	0	0	30
50	0	0	0	0	0	0	0	0	0	2
60	0	0	0	0	0	0	0	0	0	1
70	0	0	0	0	0	0	0	0	0	1
80	0	0	0	0	0	0	0	0	0	1
90	0	0	0	0	0	0	0	0	0	3
100	0	1	0	0	0	0	0	0	0	120
110	0	0	0	0	0	0	0	0	1	120
120	0	0	0	0	0	0	0	0	5	120
130	0	0	0	0	0	0	0	0	0	90
140	0	0	0	0	0	0	0	0	2	15
150	0	0	0	0	0	0	0	0	1	5
160	0	0	0	0	0	0	0	0	0	1
170	0	0	0	0	1	0	0	0	0	4
180	1	0	1	0	0	0	0	1	120	100
190	50	0	0	1	1	30	0	5	120	100
200	40	0	1	0	2	7	0	3	120	100

Date	01/05/96	15/05/96	02/06/96	24/06/96
Time	15:05	13:05	16:55	12:15
10	110	5	15	10
20	110	5	30	20
30	30	100	0	60
40	5	100	15	10
50	1	100	4	15
60	0	80	2	1
70	0	40	1	5
80	0	40	4	3
90	3	100	30	3
100	3	10	60	5
110	110	15	70	30
120	110	/	90	40
130	10	10	90	10
140	3	80	30	1
150	20	90	4	0
160	0	40	4	0
170	0	40	10	0
180	4	120	10	0
190	10	50	60	3
200	90	10	110	10

Appendix B: Foraging activity counts for Dimsdale grids 1 and 2 for 1994 to 1996

Dimsdale grid 1, trees 1 to 50 (1994)

Tree No.	Species	Girth /m	19/04/94	02/06/94	16/06/94	30/06/94	14/07/94	28/07/94	12/08/94
1	Oak	1.31	3	5	5	4	4	3	4
2	Oak	1.2	1	2	2	3	1	1	2
3	Oak	1.4	2	3	3	3	5	3	3
4	Oak	1.08	2	4	4	3	4	3	3
5	Oak	0.78	1	2	3	3	4	1	2
6	Oak	1.17	1	2	2	2	3	1	1
7	Oak	1.22	2	2	3	4	5	2	2
8	Oak	1.1	1	1	2	2	3	1	1
9	Oak	0.4	1	1	0	0	0	0	0
10	Beech	2.23	2	1	2	3	4	0	2
11	Oak	1.39	4	4	5	4	4	3	3
12	Oak	1.13	2	5	5	4	5	3	4
13	Oak	0.81	1	1	3	3	3	3	2
14	Oak	0.83	2	2	2	2	3	0	1
15	Oak	1.36	3	5	4	5	5	4	4
16	Oak	0.98	3	5	4	4	4	4	3
17	Oak	0.17	0	1	1	1	1	0	0
18	Oak	1.33	2	4	4	5	5	3	3
19	Holly	0.33	1	1	1	1	2	1	0
20	Oak	1.48	3	3	4	4	4	3	3
21	Oak	1.07	1	3	3	3	3	1	3
22	Oak	1.19	2	2	4	4	3	0	2
23	Silver birch	0.06	0	0	0	0	0	0	0
24	Beech	0.08	0	0	0	1	0	0	0
25	Silver birch	0.02	0	0	0	0	0	0	0
26	Oak	0.99	2	1	2	2	3	1	2
27	Oak	1.11	2	3	3	3	3	1	1
28	Oak	1.21	2	3	3	4	4	2	3
29	Holly	0.06	0	0	0	0	0	0	0
30	Oak	1.36	2	3	3	3	4	3	3
31	Oak	0.66	1	2	3	2	1	1	1
32	Silver birch	0.09	0	2	2	1	1	0	0
33	Silver birch	0.3	0	0	2	2	1	0	0
34	Silver birch	0.28	0	1	1	1	1	0	0
35	Silver birch	0.4	1	1	2	2	1	1	0
36	Beech	0.06	0	0	0	0	0	0	0
37	Silver birch	0.1	0	0	0	0	0	0	0
38	Silver birch	0.16	0	1	1	0	1	0	0
39	Silver birch	0.46	0	1	1	1	0	0	1
40	Silver birch	0.12	0	0	1	0	0	0	0
41	Beech	0.05	0	1	0	0	0	0	0
41.1	Beech	0.12	/	/	/	0	0	0	0
42	Beech	0.15	0	0	1	0	2	0	1
43	Oak	1.58	3	4	5	5	4	4	4
44	Beech	1.78	1	1	3	3	3	2	3
45	Beech	0.12	0	0	1	1	1	0	0
46.1	Beech	0.89	1	0	1	2	2	0	2
46.2	Beech	0.55	1	0	1	1	1	0	0
47	Oak	1.9	1	1	2	2	1	0	1
48	Beech	3.38	1	2	2	1	1	0	0
49	Silver birch	0.04	0	0	0	/	0	0	0
50	Beech	0.23	0	1	1	1	1	0	1

Tree No.	Species	Girth /m	02/09/94	16/09/94	27/10/94	10/11/94	23/11/94	09/12/94
1	Oak	1.31	4	3	3	2	2	0
2	Oak	1.2	1	2	1	0	1	0
3	Oak	1.4	3	3	1	0	0	0
4	Oak	1.08	3	2	1	0	0	0
5	Oak	0.78	2	2	1	0	1	0
6	Oak	1.17	1	1	0	0	0	0
7	Oak	1.22	3	2	0	0	1	0
8	Oak	1.1	2	1	0	0	0	0
9	Oak	0.4	1	1	0	1	0	0
10	Beech	2.23	2	2	1	1	1	0
11	Oak	1.39	3	3	2	0	1	0
12	Oak	1.13	4	3	2	2	1	0
13	Oak	0.81	2	2	1	0	0	0
14	Oak	0.83	1	2	0	0	0	0
15	Oak	1.36	5	4	1	1	1	0
16	Oak	0.98	4	3	1	1	1	0
17	Oak	0.17	0	1	0	1	0	0
18	Oak	1.33	3	3	2	1	0	0
19	Holly	0.33	1	0	0	0	0	0
20	Oak	1.48	3	3	2	0	0	0
21	Oak	1.07	3	2	0	1	0	0
22	Oak	1.19	3	2	0	1	0	0
23	Silver birch	0.06	0	0	0	0	0	0
24	Beech	0.08	0	0	0	0	0	0
25	Silver birch	0.02	0	0	0	0	0	0
26	Oak	0.99	2	2	0	0	0	0
27	Oak	1.11	2	1	0	0	0	0
28	Oak	1.21	2	2	1	1	0	0
29	Holly	0.06	0	0	0	0	0	0
30	Oak	1.36	3	3	1	1	0	0
31	Oak	0.66	1	1	0	0	0	0
32	Silver birch	0.09	0	0	0	0	0	0
33	Silver birch	0.3	0	0	0	0	0	0
34	Silver birch	0.28	0	0	0	0	0	0
35	Silver birch	0.4	1	0	0	0	0	0
36	Beech	0.06	0	0	0	0	0	0
37	Silver birch	0.1	0	0	0	1	0	0
38	Silver birch	0.16	1	2	1	0	0	0
39	Silver birch	0.46	0	1	0	0	0	0
40	Silver birch	0.12	1	0	0	0	0	0
41	Beech	0.05	0	0	0	0	0	0
41.1	Beech	0.12	0	0	0	1	0	0
42	Beech	0.15	0	0	1	0	0	0
43	Oak	1.58	4	3	3	2	1	0
44	Beech	1.78	3	3	3	1	1	0
45	Beech	0.12	2	2	1	2	1	0
46.1	Beech	0.89	1	2	0	1	1	0
46.2	Beech	0.55	1	2	0	0	0	0
47	Oak	1.9	1	1	0	0	0	0
48	Beech	3.38	0	0	0	0	0	0
49	Silver birch	0.04	0	0	0	0	0	0
50	Beech	0.23	0	0	0	0	0	0

Dimsdale grid 1, trees 1 to 50 (1995)

Tree No.	Species	Girth /m	04/01/95	08/02/95	08/03/95	22/03/95	07/04/95	12/04/95	20/04/95
1	Oak	1.31	0	0	0	1	4	4	4
2	Oak	1.2	0	0	0	1	2	2	3
3	Oak	1.4	0	0	0	0	2	3	3
4	Oak	1.08	0	0	0	0	3	3	3
5	Oak	0.78	0	0	0	0	1	1	1
6	Oak	1.17	0	0	0	0	1	2	1
7	Oak	1.22	0	0	0	0	1	3	2
8	Oak	1.1	0	0	0	0	1	2	2
9	Oak	0.4	0	0	0	0	0	1	1
10	Beech	2.23	0	0	0	0	1	1	1
11	Oak	1.39	0	0	0	1	4	3	3
12	Oak	1.13	0	0	0	1	3	3	3
13	Oak	0.81	0	0	0	1	2	2	2
14	Oak	0.83	0	0	0	1	2	2	2
15	Oak	1.36	0	0	0	2	3	4	3
16	Oak	0.98	0	0	0	2	3	3	3
17	Oak	0.17	0	0	0	0	1	1	1
18	Oak	1.33	0	0	0	0	3	3	3
19	Holly	0.33	0	0	0	0	1	0	1
20	Oak	1.48	0	0	0	0	3	3	4
21	Oak	1.07	0	0	0	0	1	2	2
22	Oak	1.19	0	0	0	0	1	2	3
23	Silver birch	0.06	0	0	0	0	0	0	0
24	Beech	0.08	0	0	0	0	0	0	0
25	Silver birch	0.02	0	0	0	0	0	0	0
26	Oak	0.99	0	0	0	0	1	1	2
27	Oak	1.11	0	0	0	1	1	2	1
28	Oak	1.21	0	0	0	0	2	2	3
29	Holly	0.06	0	0	0	0	0	0	0
30	Oak	1.36	0	0	0	1	2	3	3
31	Oak	0.66	0	0	0	2	1	2	1
32	Silver birch	0.09	0	0	0	1	1	1	1
33	Silver birch	0.3	0	0	0	1	1	0	2
34	Silver birch	0.28	0	0	0	1	1	0	1
35	Silver birch	0.4	0	0	0	1	2	1	3
36	Beech	0.06	0	0	0	0	1	0	0
37	Silver birch	0.1	0	0	0	1	0	0	0
38	Silver birch	0.16	0	0	0	0	1	0	1
39	Silver birch	0.46	0	0	0	1	1	1	2
40	Silver birch	0.12	0	0	0	0	1	0	1
41	Beech	0.05	0	0	0	0	0	0	1
41.1	Beech	0.12	0	0	0	1	1	0	0
42	Beech	0.15	0	0	0	1	1	1	2
43	Oak	1.58	0	0	0	3	3	3	4
44	Beech	1.78	0	0	0	2	2	2	2
45	Beech	0.12	0	0	0	1	1	1	1
46.1	Beech	0.89	0	0	0	2	1	1	2
46.2	Beech	0.55	0	0	0	1	1	1	2
47	Oak	1.9	0	0	0	2	2	2	3
48	Beech	3.38	0	0	0	0	1	0	1
49	Silver birch	0.04	0	0	0	0	0	0	0
50	Beech	0.23	0	0	0	1	0	1	0

Tree No.	Species	Girth /m	04/05/95	11/05/95	18/05/95	24/05/95	31/05/95	08/06/95	13/06/95
1	Oak	1.31	4	3	4	3	3	3	3
2	Oak	1.2	3	0	1	2	2	2	1
3	Oak	1.4	3	1	3	2	2	3	0
4	Oak	1.08	3	1	2	2	3	3	1
5	Oak	0.78	2	0	2	1	2	2	0
6	Oak	1.17	2	1	1	2	2	2	1
7	Oak	1.22	3	1	0	1	2	1	0
8	Oak	1.1	2	1	0	1	1	1	0
9	Oak	0.4	1	0	1	1	1	1	0
10	Beech	2.23	2	1	1	2	2	2	1
11	Oak	1.39	3	3	3	3	3	3	2
12	Oak	1.13	3	1	2	3	3	3	3
13	Oak	0.81	3	1	2	3	3	2	3
14	Oak	0.83	2	1	2	2	2	2	1
15	Oak	1.36	3	0	2	3	2	2	1
16	Oak	0.98	3	1	2	3	3	3	1
17	Oak	0.17	1	0	1	1	1	1	1
18	Oak	1.33	3	0	3	2	2	2	2
19	Holly	0.33	2	0	1	1	0	0	1
20	Oak	1.48	3	0	3	3	3	1	1
21	Oak	1.07	2	0	1	1	1	1	0
22	Oak	1.19	3	0	1	1	2	1	1
23	Silver birch	0.06	0	0	0	0	0	0	0
24	Beech	0.08	0	0	0	1	1	0	0
25	Silver birch	0.02	0	0	0	1	0	0	0
26	Oak	0.99	2	0	0	1	1	1	0
27	Oak	1.11	3	0	1	1	1	1	0
28	Oak	1.21	3	0	2	2	2	1	1
29	Holly	0.06	1	0	0	0	0	1	0
30	Oak	1.36	3	1	1	2	1	1	2
31	Oak	0.66	2	1	2	2	3	2	2
32	Silver birch	0.09	0	0	1	1	1	1	1
33	Silver birch	0.3	0	0	1	0	0	1	1
34	Silver birch	0.28	1	0	1	0	0	0	1
35	Silver birch	0.4	1	1	2	1	2	1	1
36	Beech	0.06	0	0	1	0	0	0	0
37	Silver birch	0.1	0	0	1	0	1	1	0
38	Silver birch	0.16	0	1	1	0	1	1	0
39	Silver birch	0.46	1	1	1	0	1	1	0
40	Silver birch	0.12	0	0	1	0	0	0	0
41	Beech	0.05	0	0	1	1	0	0	0
41.1	Beech	0.12	1	1	2	1	0	1	1
42	Beech	0.15	2	1	2	2	2	1	1
43	Oak	1.58	3	3	4	3	3	3	3
44	Beech	1.78	3	2	3	3	3	4	3
45	Beech	0.12	1	1	2	1	2	2	2
46.1	Beech	0.89	0	0	1	1	2	2	1
46.2	Beech	0.55	1	0	0	1	1	1	1
47	Oak	1.9	2	2	3	3	3	3	3
48	Beech	3.38	1	0	1	1	0	0	0
49	Silver birch	0.04	0	0	0	1	0	0	0
50	Beech	0.23	1	1	0	1	1	2	1

Tree No.	Species	Girth /m	21/06/95	28/06/95	05/07/95	12/07/95	19/07/95	26/07/95	03/08/95
1	Oak	1.31	3	3	3	3	3	4	4
2	Oak	1.2	2	1	2	1	1	2	1
3	Oak	1.4	2	2	1	1	2	2	2
4	Oak	1.08	2	2	3	3	3	2	3
5	Oak	0.78	1	1	1	1	1	2	2
6	Oak	1.17	1	1	2	1	1	2	1
7	Oak	1.22	2	2	3	2	3	3	3
8	Oak	1.1	2	1	2	1	1	2	1
9	Oak	0.4	1	1	1	1	1	1	1
10	Beech	2.23	2	2	3	2	3	3	2
11	Oak	1.39	2	2	2	1	2	3	2
12	Oak	1.13	3	2	3	2	3	3	3
13	Oak	0.81	2	2	1	1	1	2	1
14	Oak	0.83	2	2	2	1	1	1	1
15	Oak	1.36	2	2	1	1	1	3	1
16	Oak	0.98	3	1	2	1	1	2	2
17	Oak	0.17	1	1	1	0	1	1	1
18	Oak	1.33	2	2	2	1	2	3	3
19	Holly	0.33	1	1	0	1	1	1	0
20	Oak	1.48	2	2	2	1	1	2	1
21	Oak	1.07	1	1	1	1	1	2	1
22	Oak	1.19	2	2	2	1	1	2	1
23	Silver birch	0.06	0	1	0	0	0	0	0
24	Beech	0.08	1	1	1	1	1	1	1
25	Silver birch	0.02	0	1	0	0	0	0	0
26	Oak	0.99	2	1	2	1	1	1	1
27	Oak	1.11	2	1	2	1	1	2	1
28	Oak	1.21	2	1	1	1	1	2	1
29	Holly	0.06	0	1	0	0	1	/	0
30	Oak	1.36	2	1	2	1	1	2	2
31	Oak	0.66	2	1	2	1	1	1	1
32	Silver birch	0.09	1	0	1	1	1	1	0
33	Silver birch	0.3	1	1	2	1	1	0	1
34	Silver birch	0.28	1	1	1	1	1	1	1
35	Silver birch	0.4	2	2	2	0	1	1	1
36	Beech	0.06	0	0	0	0	0	0	0
37	Silver birch	0.1	0	0	0	1	0	0	0
38	Silver birch	0.16	1	1	1	0	1	1	1
39	Silver birch	0.46	1	0	1	1	1	0	0
40	Silver birch	0.12	0	0	0	0	0	0	0
41	Beech	0.05	0	0	0	0	1	1	0
41.1	Beech	0.12	0	0	0	0	0	1	0
42	Beech	0.15	0	1	0	0	1	0	0
43	Oak	1.58	3	3	2	2	1	3	3
44	Beech	1.78	3	3	4	4	4	4	4
45	Beech	0.12	0	2	2	2	3	2	2
46.1	Beech	0.89	2	2	3	2	3	2	1
46.2	Beech	0.55	1	2	3	2	3	2	1
47	Oak	1.9	2	2	1	1	1	1	2
48	Beech	3.38	1	0	2	1	1	0	1
49	Silver birch	0.04	1	0	0	0	0	0	0
50	Beech	0.23	1	1	1	0	1	1	0

Tree No.	Species	Girth /m	09/08/95	16/08/95	23/08/95	30/08/95	06/09/95	13/09/95	20/09/95
1	Oak	1.31	3	3	3	4	4	3	3
2	Oak	1.2	1	1	1	2	1	0	1
3	Oak	1.4	2	2	2	1	1	0	2
4	Oak	1.08	3	1	3	3	2	2	2
5	Oak	0.78	2	1	1	1	0	0	2
6	Oak	1.17	2	1	0	2	2	1	1
7	Oak	1.22	2	2	3	1	3	2	3
8	Oak	1.1	1	1	2	1	1	0	1
9	Oak	0.4	0	0	1	1	1	0	0
10	Beech	2.23	1	1	3	1	1	2	3
11	Oak	1.39	2	2	2	3	3	2	2
12	Oak	1.13	3	3	3	3	3	3	3
13	Oak	0.81	1	1	1	1	1	1	2
14	Oak	0.83	1	0	1	1	1	0	1
15	Oak	1.36	2	1	2	3	3	3	3
16	Oak	0.98	2	1	2	3	2	2	3
17	Oak	0.17	0	0	1	0	0	0	0
18	Oak	1.33	3	3	3	3	3	3	3
19	Holly	0.33	1	0	1	1	1	1	1
20	Oak	1.48	2	1	2	3	2	2	3
21	Oak	1.07	2	1	2	1	1	1	2
22	Oak	1.19	1	0	0	2	1	1	1
23	Silver birch	0.06	0	0	0	0	0	0	0
24	Beech	0.08	1	1	1	1	1	1	1
25	Silver birch	0.02	dead	dead	dead	dead	dead	dead	dead
26	Oak	0.99	1	1	2	1	1	1	1
27	Oak	1.11	1	2	1	1	1	0	1
28	Oak	1.21	1	1	1	1	1	0	1
29	Holly	0.06	0	0	0	1	0	0	0
30	Oak	1.36	2	1	2	2	3	1	0
31	Oak	0.66	1	0	1	1	1	1	1
32	Silver birch	0.09	0	0	0	0	0	0	0
33	Silver birch	0.3	0	0	0	0	0	0	0
34	Silver birch	0.28	0	0	0	1	0	0	1
35	Silver birch	0.4	1	1	0	1	1	0	0
36	Beech	0.06	0	1	1	0	0	1	1
37	Silver birch	0.1	0	0	0	1	1	0	0
38	Silver birch	0.16	1	1	1	1	1	1	1
39	Silver birch	0.46	0	0	0	0	0	0	0
40	Silver birch	0.12	0	0	0	0	0	0	0
41	Beech	0.05	0	0	0	0	0	0	0
41.1	Beech	0.12	1	0	0	1	0	0	0
42	Beech	0.15	1	1	1	1	1	0	1
43	Oak	1.58	3	3	3	3	3	3	3
44	Beech	1.78	4	3	3	3	3	3	3
45	Beech	0.12	2	2	2	1	2	2	1
46.1	Beech	0.89	1	1	2	2	2	2	2
46.2	Beech	0.55	2	1	2	2	2	0	2
47	Oak	1.9	1	1	0	2	1	1	1
48	Beech	3.38	1	0	0	1	1	0	2
49	Silver birch	0.04	0	0	0	0	0	0	0
50	Beech	0.23	0	0	0	0	0	0	1

Tree No.	Species	Girth /m	27/09/95	11/10/95	18/10/95	25/10/95	01/11/95	08/11/95	15/11/95
1	Oak	1.31	3	3	3	3	3	3	2
2	Oak	1.2	1	1	1	0	1	0	0
3	Oak	1.4	1	1	2	1	0	1	0
4	Oak	1.08	2	2	0	1	1	1	0
5	Oak	0.78	0	1	1	1	0	0	0
6	Oak	1.17	1	1	1	1	1	0	0
7	Oak	1.22	1	3	2	0	1	1	0
8	Oak	1.1	1	1	0	1	1	1	0
9	Oak	0.4	0	0	0	0	1	0	0
10	Beech	2.23	2	3	3	1	2	1	1
11	Oak	1.39	1	2	2	1	2	1	0
12	Oak	1.13	3	3	2	2	2	2	1
13	Oak	0.81	2	1	0	1	1	1	0
14	Oak	0.83	2	1	1	1	1	0	0
15	Oak	1.36	2	3	2	2	2	1	0
16	Oak	0.98	2	2	2	2	1	1	0
17	Oak	0.17	0	1	0	1	1	0	0
18	Oak	1.33	2	2	2	2	2	1	1
19	Holly	0.33	0	0	1	1	0	0	0
20	Oak	1.48	2	3	3	2	1	1	0
21	Oak	1.07	1	3	1	1	0	1	0
22	Oak	1.19	0	2	2	1	2	0	0
23	Silver birch	0.06	0	0	0	0	0	0	0
24	Beech	0.08	1	1	1	1	0	1	0
25	Silver birch	0.02	dead	dead	dead	dead	dead	dead	dead
26	Oak	0.99	0	0	1	1	1	0	0
27	Oak	1.11	1	1	1	1	1	0	0
28	Oak	1.21	0	1	1	1	1	0	0
29	Holly	0.06	0	0	0	0	0	0	0
30	Oak	1.36	1	1	0	0	0	0	0
31	Oak	0.66	1	1	1	1	1	1	0
32	Silver birch	0.09	0	0	0	0	0	0	0
33	Silver birch	0.3	0	0	0	0	1	1	0
34	Silver birch	0.28	0	0	0	0	0	0	0
35	Silver birch	0.4	0	1	0	1	0	0	0
36	Beech	0.06	0	1	0	1	0	0	1
37	Silver birch	0.1	0	0	0	1	0	0	0
38	Silver birch	0.16	0	0	0	0	0	0	0
39	Silver birch	0.46	0	0	0	0	0	0	0
40	Silver birch	0.12	0	0	1	0	0	0	0
41	Beech	0.05	0	1	0	0	0	0	0
41.1	Beech	0.12	1	1	2	0	0	0	0
42	Beech	0.15	1	1	1	1	0	1	1
43	Oak	1.58	3	3	3	3	2	2	1
44	Beech	1.78	3	3	3	3	3	2	2
45	Beech	0.12	1	2	1	1	0	1	0
46.1	Beech	0.89	1	2	1	2	1	0	0
46.2	Beech	0.55	1	1	0	0	0	0	0
47	Oak	1.9	0	0	1	1	1	0	0
48	Beech	3.38	0	1	1	1	1	0	0
49	Silver birch	0.04	0	0	0	0	0	0	0
50	Beech	0.23	0	0	1	1	0	1	0

Tree No.	Species	Girth /m	22/11/95	29/11/95
1	Oak	1.31	2	0
2	Oak	1.2	0	0
3	Oak	1.4	1	0
4	Oak	1.08	0	0
5	Oak	0.78	0	0
6	Oak	1.17	0	0
7	Oak	1.22	0	0
8	Oak	1.1	0	0
9	Oak	0.4	0	0
10	Beech	2.23	0	0
11	Oak	1.39	0	0
12	Oak	1.13	1	0
13	Oak	0.81	0	0
14	Oak	0.83	0	0
15	Oak	1.36	0	0
16	Oak	0.98	0	0
17	Oak	0.17	0	0
18	Oak	1.33	0	0
19	Holly	0.33	0	0
20	Oak	1.48	1	0
21	Oak	1.07	0	0
22	Oak	1.19	0	0
23	Silver birch	0.06	0	0
24	Beech	0.08	0	0
25	Silver birch	0.02	dead	dead
26	Oak	0.99	0	0
27	Oak	1.11	0	0
28	Oak	1.21	0	0
29	Holly	0.06	0	0
30	Oak	1.36	0	0
31	Oak	0.66	0	0
32	Silver birch	0.09	0	0
33	Silver birch	0.3	0	0
34	Silver birch	0.28	0	0
35	Silver birch	0.4	0	0
36	Beech	0.06	0	0
37	Silver birch	0.1	0	0
38	Silver birch	0.16	0	0
39	Silver birch	0.46	0	1
40	Silver birch	0.12	0	0
41	Beech	0.05	0	0
41.1	Beech	0.12	0	0
42	Beech	0.15	0	0
43	Oak	1.58	0	0
44	Beech	1.78	1	1
45	Beech	0.12	1	0
46.1	Beech	0.89	0	0
46.2	Beech	0.55	0	0
47	Oak	1.9	0	0
48	Beech	3.38	0	0
49	Silver birch	0.04	0	0
50	Beech	0.23	0	0

Dimsdale grid 1, trees 1 to 50 (1996)

Tree No.	Species	Girth /m	10/01/96	17/01/96	31/01/96	14/02/96	28/02/96	13/03/96	27/03/96
1	Oak	1.31	0	0	0	0	0	0	0
2	Oak	1.2	0	0	0	0	0	0	0
3	Oak	1.4	0	0	0	0	0	0	0
4	Oak	1.08	0	0	0	0	0	0	0
5	Oak	0.78	0	0	0	0	0	0	0
6	Oak	1.17	0	0	0	0	0	0	0
7	Oak	1.22	0	0	0	0	0	0	0
8	Oak	1.1	0	0	0	0	0	0	0
9	Oak	0.4	0	0	0	0	0	0	0
10	Beech	2.23	0	0	0	0	0	0	0
11	Oak	1.39	0	0	0	0	0	0	0
12	Oak	1.13	0	0	0	0	0	0	0
13	Oak	0.81	0	0	0	0	0	0	0
14	Oak	0.83	0	0	0	0	0	0	0
15	Oak	1.36	0	0	0	0	0	0	0
16	Oak	0.98	0	0	0	0	0	0	0
17	Oak	0.17	0	0	0	0	0	0	0
18	Oak	1.33	0	0	0	0	0	0	0
19	Holly	0.33	0	0	0	0	0	0	0
20	Oak	1.48	0	0	0	0	0	0	0
21	Oak	1.07	0	0	0	0	0	0	0
22	Oak	1.19	0	0	0	0	0	0	0
23	Silver birch	0.06	0	0	0	0	0	0	0
24	Beech	0.08	0	0	0	0	0	0	0
25	Silver birch	0.02	dead	dead	dead	dead	dead	dead	dead
26	Oak	0.99	0	0	0	0	0	0	0
27	Oak	1.11	0	0	0	0	0	0	0
28	Oak	1.21	0	0	0	0	0	0	0
29	Holly	0.06	0	0	0	0	0	0	0
30	Oak	1.36	0	0	0	0	0	0	0
31	Oak	0.66	0	0	0	0	0	0	0
32	Silver birch	0.09	0	0	0	0	0	0	0
33	Silver birch	0.3	0	0	0	0	0	0	0
34	Silver birch	0.28	0	0	0	0	0	0	0
35	Silver birch	0.4	0	0	0	0	0	0	0
36	Beech	0.06	0	0	0	0	0	0	0
37	Silver birch	0.1	0	0	0	0	0	0	0
38	Silver birch	0.16	0	0	0	0	0	0	0
39	Silver birch	0.46	0	0	0	0	0	0	0
40	Silver birch	0.12	0	0	0	0	0	0	0
41	Beech	0.05	0	0	0	0	0	0	0
41.1	Beech	0.12	0	0	0	0	0	0	0
42	Beech	0.15	0	0	0	0	0	0	0
43	Oak	1.58	0	0	0	0	0	0	0
44	Beech	1.78	0	0	0	0	0	0	0
45	Beech	0.12	0	0	0	0	0	0	0
46.1	Beech	0.89	0	0	0	0	0	0	0
46.2	Beech	0.55	0	0	0	0	0	0	0
47	Oak	1.9	0	0	0	0	0	0	0
48	Beech	3.38	0	0	0	0	0	0	0
49	Silver birch	0.04	0	0	0	0	0	0	0
50	Beech	0.23	0	0	0	0	0	0	0

Tree No.	Species	Girth /m	03/04/96	17/04/96	01/05/96	15/05/96	22/05/96	02/06/96	24/06/96	26/06/96
1	Oak	1.31	1	1	5	5	4	5	3	3
2	Oak	1.2	1	0	2	4	1	2	1	1
3	Oak	1.4	0	1	3	3	3	4	2	1
4	Oak	1.08	0	1	3	3	2	3	2	1
5	Oak	0.78	0	0	1	2	2	1	1	1
6	Oak	1.17	0	0	2	3	1	1	2	2
7	Oak	1.22	0	1	2	4	2	3	1	1
8	Oak	1.1	0	0	1	4	1	1	1	1
9	Oak	0.4	0	0	1	1	1	1	0	1
10	Beech	2.23	1	1	1	2	1	1	0	1
11	Oak	1.39	0	1	3	4	4	4	3	2
12	Oak	1.13	1	0	3	4	3	3	3	2
13	Oak	0.81	1	0	1	2	2	2	1	2
14	Oak	0.83	0	0	1	2	1	2	1	1
15	Oak	1.36	1	0	3	4	2	3	3	2
16	Oak	0.98	1	1	2	4	1	3	2	2
17	Oak	0.17	0	0	1	1	1	1	0	1
18	Oak	1.33	0	0	2	4	3	4	3	1
19	Holly	0.33	0	0	1	1	1	1	0	1
20	Oak	1.48	1	1	3	4	3	4	2	2
21	Oak	1.07	1	0	3	4	2	3	1	1
22	Oak	1.19	0	1	2	3	2	3	2	1
23	Silver birch	0.06	0	0	0	1	0	0	0	0
24	Beech	0.08	0	0	0	1	0	0	0	0
25	Silver birch	0.02	dead	dead	dead	dead	dead	dead	dead	dead
26	Oak	0.99	0	0	1	3	2	3	1	0
27	Oak	1.11	0	0	2	4	3	3	1	0
28	Oak	1.21	0	0	2	3	3	3	1	1
29	Holly	0.06	0	0	0	0	0	0	0	1
30	Oak	1.36	0	0	2	3	2	3	0	1
31	Oak	0.66	0	0	2	2	1	2	2	1
32	Silver birch	0.09	1	1	0	0	0	0	1	0
33	Silver birch	0.3	1	0	1	2	0	1	2	1
34	Silver birch	0.28	1	0	1	2	0	2	2	2
35	Silver birch	0.4	1	0	2	1	1	1	1	1
36	Beech	0.06	0	0	0	0	0	1	0	0
37	Silver birch	0.1	0	0	0	0	0	0	0	0
38	Silver birch	0.16	0	0	1	0	0	1	1	0
39	Silver birch	0.46	0	0	1	1	0	1	0	0
40	Silver birch	0.12	0	0	0	0	0	1	1	0
41	Beech	0.05	0	0	0	0	0	0	0	1
41.1	Beech	0.12	0	0	0	0	0	0	0	0
42	Beech	0.15	0	0	0	0	0	0	1	0
43	Oak	1.58	1	0	2	4	4	5	3	3
44	Beech	1.78	1	1	1	2	1	1	4	3
45	Beech	0.12	0	0	0	0	0	1	0	1
46.1	Beech	0.89	0	0	0	1	0	1	1	1
46.2	Beech	0.55	0	0	0	0	0	1	1	1
47	Oak	1.9	1	0	1	3	2	3	3	1
48	Beech	3.38	0	0	0	1	1	1	1	1
49	Silver birch	0.04	0	0	0	0	0	0	0	0
50	Beech	0.23	0	1	0	0	0	0	1	1

Dimsdale grid 1, trees 51 to 100 (1994)

Tree No.	Species	Girth /m	19/04/94	02/06/94	16/06/94	30/06/94	14/07/94	28/07/94	12/08/94
51	Oak	1.51	3	4	3	4	4	3	3
52	Silver birch	0.25	1	1	2	2	1	0	0
53	Silver birch	0.21	1	2	2	2	2	2	0
54	Beech	0.13	1	1	1	1	0	0	0
55	Silver birch	0.5	1	2	3	3	1	0	0
56	Silver birch	0.17	0	0	1	1	0	0	0
57	Silver birch	0.15	0	0	0	0	0	0	0
58	Silver birch	0.37	1	1	2	1	1	0	0
59	Silver birch	0.24	1	1	1	1	0	0	0
60	Silver birch	0.18	0	1	2	1	1	0	0
61	Silver birch	0.23	0	1	2	2	0	0	0
62	Beech	0.2	0	0	1	1	0	0	1
63	Silver birch	0.26	0	0	0	0	0	0	0
64	Beech	0.12	1	0	0	0	0	0	0
65	Beech	2.13	2	2	2	3	2	0	1
66.1	Oak	1.14	2	4	4	4	4	3	3
66.2	Oak	0.28	1	1	1	1	0	0	1
67	Oak	1.17	2	4	4	4	4	3	3
68.1	Beech	0.65	0	1	2	2	3	1	2
68.2	Beech	0.52	0	1	2	2	1	0	0
68.3	Beech	0.44	0	0	1	1	1	0	0
69	Beech	2.48	1	1	1	2	1	0	0
70	Beech	1.52	1	1	1	3	2	0	1
71	Oak	2.54	4	5	5	5	5	4	5
72	Oak	1.42	2	3	3	3	4	3	3
73	Oak	1.3	1	3	3	4	4	1	1
74	Silver birch	0.09	0	0	0	1	0	0	0
75	Silver birch	0.32	0	1	0	0	0	0	0
76	Silver birch	0.25	1	1	1	1	0	0	0
77	Silver birch	0.13	0	0	0	1	0	0	0
78	Silver birch	0.09	2	1	1	0	0	0	0
79	Oak	0.12	0	1	0	1	0	0	0
80	Silver birch	0.17	0	1	1	1	0	0	0
81	Silver birch	0.11	0	0	0	1	0	0	0
82	Beech	0.02	0	0	0	0	0	0	0
83	Oak	1.24	2	4	4	3	4	3	3
84	Silver birch	0.1	1	1	0	0	0	0	0
85	Silver birch	0.25	1	1	2	2	1	0	0
86	Silver birch	0.31	1	1	2	1	1	0	0
87	Silver birch	0.17	0	1	1	1	0	0	0
88.1	Silver birch	0.21	2	1	1	2	1	0	0
88.2	Silver birch	0.23	1	1	2	2	1	0	0
88.3	Silver birch	0.13	0	1	0	1	0	0	0
89	Silver birch	0.28	1	2	3	2	1	0	2
90	Silver birch	0.18	1	1	1	1	0	0	0
91	Silver birch	0.22	1	1	2	1	0	0	0
92	Whitebeam	0.08	1	1	1	0	0	0	0
93	Silver birch	0.08	1	1	0	1	0	0	0
94	Silver birch	0.08	1	1	1	0	0	0	0
95	Silver birch	0.15	0	0	0	1	0	0	0
96	Silver birch	0.28	0	2	2	1	0	0	0
97	Whitebeam	0.09	0	0	0	1	0	0	0
98	Silver birch	0.16	0	1	1	1	0	0	0
99	Silver birch	0.08	0	0	0	0	0	0	0
100	Silver birch	0.22	0	0	1	1	1	0	0

Tree No.	Species	Girth /m	02/09/94	16/09/94	27/10/94	10/11/94	23/11/94	09/12/94
51	Oak	1.51	3	3	2	1	0	0
52	Silver birch	0.25	0	1	0	0	1	0
53	Silver birch	0.21	1	0	1	0	0	0
54	Beech	0.13	0	0	0	0	1	0
55	Silver birch	0.5	0	0	0	0	0	0
56	Silver birch	0.17	1	1	0	0	0	0
57	Silver birch	0.15	0	0	0	0	0	0
58	Silver birch	0.37	0	1	0	0	0	0
59	Silver birch	0.24	0	0	0	0	0	0
60	Silver birch	0.18	1	0	0	0	0	0
61	Silver birch	0.23	0	0	0	0	0	0
62	Beech	0.2	0	1	0	0	0	0
63	Silver birch	0.26	0	0	0	0	0	0
64	Beech	0.12	1	1	0	0	0	0
65	Beech	2.13	0	1	0	0	0	0
66.1	Oak	1.14	3	3	1	0	0	0
66.2	Oak	0.28	0	0	0	0	0	0
67	Oak	1.17	3	3	1	0	0	0
68.1	Beech	0.65	2	2	1	0	0	0
68.2	Beech	0.52	1	1	1	0	0	0
68.3	Beech	0.44	0	1	0	0	0	0
69	Beech	2.48	0	0	0	0	0	0
70	Beech	1.52	1	1	0	1	0	0
71	Oak	2.54	3	3	2	1	0	0
72	Oak	1.42	4	2	0	0	0	0
73	Oak	1.3	2	1	0	0	0	0
74	Silver birch	0.09	0	0	0	0	0	0
75	Silver birch	0.32	0	0	0	0	0	0
76	Silver birch	0.25	1	0	0	0	0	0
77	Silver birch	0.13	0	0	0	0	0	0
78	Silver birch	0.09	0	0	0	0	0	0
79	Oak	0.12	0	1	1	0	0	0
80	Silver birch	0.17	0	0	0	0	0	0
81	Silver birch	0.11	0	0	0	0	0	0
82	Beech	0.02	0	3	0	0	0	0
83	Oak	1.24	3	0	2	2	0	0
84	Silver birch	0.1	0	0	0	0	0	0
85	Silver birch	0.25	0	0	0	0	0	0
86	Silver birch	0.31	0	0	0	0	0	0
87	Silver birch	0.17	1	0	0	0	0	0
88.1	Silver birch	0.21	0	0	0	0	0	0
88.2	Silver birch	0.23	0	0	0	0	0	0
88.3	Silver birch	0.13	0	1	0	0	0	0
89	Silver birch	0.28	0	0	0	0	0	0
90	Silver birch	0.18	0	0	0	0	0	0
91	Silver birch	0.22	0	0	0	0	0	0
92	Whitebeam	0.08	0	0	0	0	0	0
93	Silver birch	0.08	0	0	0	0	0	0
94	Silver birch	0.08	0	0	0	0	0	0
95	Silver birch	0.15	0	0	0	0	0	0
96	Silver birch	0.28	0	0	0	0	0	0
97	Whitebeam	0.09	0	0	0	0	0	0
98	Silver birch	0.16	0	0	0	0	0	0
99	Silver birch	0.08	0	0	0	0	0	0
100	Silver birch	0.22	0	0	0	0	0	0

Dimsdale grid 1, trees 51 to 100 (1995)

Tree No.	Species	Girth /m	04/01/95	08/02/95	08/03/95	22/03/95	07/04/95	12/04/95	20/04/95
51	Oak	1.51	0	0	0	1	3	3	3
52	Silver birch	0.25	0	0	0	0	0	0	1
53	Silver birch	0.21	0	0	0	0	1	0	1
54	Beech	0.13	0	0	0	1	1	0	1
55	Silver birch	0.5	0	0	0	1	1	1	2
56	Silver birch	0.17	0	0	0	0	0	0	1
57	Silver birch	0.15	0	0	0	0	0	0	1
58	Silver birch	0.37	0	0	0	1	0	2	1
59	Silver birch	0.24	0	0	0	0	1	0	1
60	Silver birch	0.18	0	0	0	0	1	1	1
61	Silver birch	0.23	0	0	0	0	1	0	1
62	Beech	0.2	0	0	0	1	1	1	1
63	Silver birch	0.26	0	0	0	0	1	0	1
64	Beech	0.12	0	0	0	0	1	0	1
65	Beech	2.13	0	0	0	0	1	1	1
66.1	Oak	1.14	0	0	0	0	2	3	2
66.2	Oak	0.28	0	0	0	0	0	0	0
67	Oak	1.17	0	0	0	0	3	3	3
68.1	Beech	0.65	0	0	0	0	1	0	1
68.2	Beech	0.52	0	0	0	0	0	1	2
68.3	Beech	0.44	0	0	0	0	1	0	1
69	Beech	2.48	0	fallen down	fallen down	fallen down	fallen down	fallen down	fallen down
70	Beech	1.52	0	0	0	1	0	1	2
71	Oak	2.54	0	0	0	0	3	3	3
72	Oak	1.42	0	0	0	0	1	1	3
73	Oak	1.3	0	0	0	0	1	2	3
74	Silver birch	0.09	0	0	0	0	0	1	0
75	Silver birch	0.32	0	0	0	0	1	0	0
76	Silver birch	0.25	0	0	0	0	0	1	0
77	Silver birch	0.13	0	0	0	0	0	0	0
78	Silver birch	0.09	0	0	0	0	0	0	0
79	Oak	0.12	0	0	0	0	0	1	1
80	Silver birch	0.17	0	0	0	0	1	0	0
81	Silver birch	0.11	0	0	0	0	1	0	0
82	Beech	0.02	0	0	0	0	1	0	0
83	Oak	1.24	0	0	0	0	4	3	2
84	Silver birch	0.1	0	0	0	0	0	0	0
85	Silver birch	0.25	0	0	0	0	1	1	1
86	Silver birch	0.31	0	0	0	0	2	1	1
87	Silver birch	0.17	0	0	0	0	1	0	0
88.1	Silver birch	0.21	0	0	0	0	1	0	1
88.2	Silver birch	0.23	0	0	0	0	1	1	1
88.3	Silver birch	0.13	0	0	0	0	1	0	0
89	Silver birch	0.28	0	0	0	0	1	0	1
90	Silver birch	0.18	0	0	0	0	1	1	1
91	Silver birch	0.22	0	0	0	0	0	0	0
92	Whitebeam	0.08	0	0	0	0	0	0	1
93	Silver birch	0.08	0	0	0	0	0	0	0
94	Silver birch	0.08	0	0	0	0	0	0	0
95	Silver birch	0.15	0	0	0	0	0	1	0
96	Silver birch	0.28	0	0	0	0	0	0	1
97	Whitebeam	0.09	0	0	0	0	0	0	0
98	Silver birch	0.16	0	0	0	0	0	0	0
99	Silver birch	0.08	0	0	0	0	0	0	0
100	Silver birch	0.22	0	0	0	0	1	0	0

Tree No.	Species	Girth /m	04/05/95	11/05/95	18/05/95	24/05/95	31/05/95	08/06/95	13/06/95
51	Oak	1.51	3	3	3	3	2	2	2
52	Silver birch	0.25	1	0	0	0	1	1	2
53	Silver birch	0.21	1	1	1	1	1	1	1
54	Beech	0.13	1	1	0	1	2	1	1
55	Silver birch	0.5	1	1	1	1	1	1	1
56	Silver birch	0.17	0	0	0	0	1	1	0
57	Silver birch	0.15	0	0	1	0	0	0	0
58	Silver birch	0.37	1	0	1	0	1	1	0
59	Silver birch	0.24	0	0	0	0	1	1	2
60	Silver birch	0.18	0	0	1	1	1	1	2
61	Silver birch	0.23	0	1	0	0	1	1	1
62	Beech	0.2	1	0	1	1	1	1	1
63	Silver birch	0.26	0	0	1	1	1	0	0
64	Beech	0.12	0	2	1	1	1	1	0
65	Beech	2.13	2	1	1	2	2	2	1
66.1	Oak	1.14	3	1	1	3	3	3	3
66.2	Oak	0.28	1	0	0	1	1	1	1
67	Oak	1.17	3	1	1	2	2	0	1
68.1	Beech	0.65	1	0	1	1	0	1	1
68.2	Beech	0.52	1	0	1	1	1	1	1
68.3	Beech	0.44	1	0	1	0	0	1	0
69	Beech	2.48	fallen down	fallen down	fallen down	fallen down	fallen down	fallen down	fallen down
70	Beech	1.52	1	1	1	2	1	1	1
71	Oak	2.54	4	2	3	3	3	3	3
72	Oak	1.42	3	0	1	1	2	1	1
73	Oak	1.3	2	2	1	1	1	2	1
74	Silver birch	0.09	0	0	0	0	1	0	0
75	Silver birch	0.32	0	0	0	0	1	2	1
76	Silver birch	0.25	1	0	0	1	1	0	0
77	Silver birch	0.13	0	0	0	0	0	1	1
78	Silver birch	0.09	0	0	0	0	0	0	1
79	Oak	0.12	1	1	0	0	1	1	0
80	Silver birch	0.17	0	1	1	1	1	1	0
81	Silver birch	0.11	0	0	1	0	0	1	0
82	Beech	0.02	0	1	1	0	0	1	1
83	Oak	1.24	3	3	3	3	3	3	3
84	Silver birch	0.1	0	0	1	1	1	1	1
85	Silver birch	0.25	0	0	0	0	0	1	0
86	Silver birch	0.31	1	0	1	0	1	1	1
87	Silver birch	0.17	1	0	0	0	1	0	0
88.1	Silver birch	0.21	0	0	0	0	0	0	0
88.2	Silver birch	0.23	0	0	0	0	0	1	0
88.3	Silver birch	0.13	0	0	0	0	0	0	0
89	Silver birch	0.28	0	0	1	0	0	1	1
90	Silver birch	0.18	0	0	1	0	0	1	1
91	Silver birch	0.22	1	0	1	0	1	1	0
92	Whitebeam	0.08	1	0	0	0	0	1	0
93	Silver birch	0.08	0	1	0	0	0	1	0
94	Silver birch	0.08	0	0	0	0	0	0	0
95	Silver birch	0.15	0	0	0	0	0	1	0
96	Silver birch	0.28	1	0	0	0	0	0	1
97	Whitebeam	0.09	0	0	0	0	1	0	1
98	Silver birch	0.16	0	0	0	1	0	0	0
99	Silver birch	0.08	1	0	0	0	0	0	0
100	Silver birch	0.22	0	0	0	0	0	0	0

Tree No.	Species	Girth /m	21/06/95	28/06/95	05/07/95	12/07/95	19/07/95	26/07/95	03/08/95
51	Oak	1.51	2	3	2	1	2	1	1
52	Silver birch	0.25	0	1	1	1	1	1	0
53	Silver birch	0.21	0	1	1	0	1	1	1
54	Beech	0.13	0	1	0	1	0	0	0
55	Silver birch	0.5	1	1	1	2	1	1	1
56	Silver birch	0.17	0	1	1	0	0	0	0
57	Silver birch	0.15	0	1	1	0	0	0	0
58	Silver birch	0.37	1	1	1	1	1	1	1
59	Silver birch	0.24	1	1	1	1	1	0	0
60	Silver birch	0.18	1	1	1	1	1	1	1
61	Silver birch	0.23	1	1	0	1	0	1	1
62	Beech	0.2	0	0	1	0	1	1	0
63	Silver birch	0.26	1	1	1	1	1	0	0
64	Beech	0.12	0	1	0	1	0	0	0
65	Beech	2.13	1	1	2	1	1	1	1
66.1	Oak	1.14	1	2	3	2	2	3	3
66.2	Oak	0.28	1	1	1	1	0	0	0
67	Oak	1.17	2	2	2	3	3	4	3
68.1	Beech	0.65	0	1	1	1	1	1	1
68.2	Beech	0.52	1	1	2	1	1	1	1
68.3	Beech	0.44	0	0	1	1	0	0	0
69	Beech	2.48	fallen down	fallen down	fallen down	fallen down	fallen down	fallen down	fallen down
70	Beech	1.52	1	1	2	2	2	2	1
71	Oak	2.54	3	2	4	4	4	5	5
72	Oak	1.42	2	1	2	1	2	3	3
73	Oak	1.3	2	2	3	3	1	1	2
74	Silver birch	0.09	0	/	0	1	0	0	0
75	Silver birch	0.32	0	1	1	0	1	1	0
76	Silver birch	0.25	1	0	0	0	0	0	1
77	Silver birch	0.13	0	1	0	0	0	0	0
78	Silver birch	0.09	0	1	0	0	0	1	0
79	Oak	0.12	0	0	0	0	0	0	0
80	Silver birch	0.17	0	0	0	0	0	1	0
81	Silver birch	0.11	1	0	0	0	0	0	0
82	Beech	0.02	0	0	0	0	1	0	0
83	Oak	1.24	3	3	3	3	3	3	3
84	Silver birch	0.1	0	0	0	0	1	0	0
85	Silver birch	0.25	0	0	1	0	0	1	0
86	Silver birch	0.31	1	1	1	1	1	0	0
87	Silver birch	0.17	0	0	0	0	0	0	0
88.1	Silver birch	0.21	1	0	1	1	1	1	0
88.2	Silver birch	0.23	0	1	1	1	0	1	0
88.3	Silver birch	0.13	0	0	0	1	0	0	0
89	Silver birch	0.28	0	1	1	1	0	1	1
90	Silver birch	0.18	0	1	2	1	1	2	1
91	Silver birch	0.22	1	0	0	1	1	1	1
92	Whitebeam	0.08	0	0	0	0	0	0	1
93	Silver birch	0.08	0	0	0	0	0	0	0
94	Silver birch	0.08	0	0	0	0	0	0	0
95	Silver birch	0.15	0	0	0	1	0	0	0
96	Silver birch	0.28	1	1	1	0	1	0	0
97	Whitebeam	0.09	0	0	0	0	1	0	0
98	Silver birch	0.16	0	0	0	0	0	1	0
99	Silver birch	0.08	0	0	0	1	1	0	0
100	Silver birch	0.22	1	0	0	0	0	0	0

Tree No.	Species	Girth /m	09/08/95	16/08/95	23/08/95	30/08/95	06/09/95	13/09/95	20/09/95
51	Oak	1.51	1	1	1	1	1	0	1
52	Silver birch	0.25	1	1	1	0	0	0	0
53	Silver birch	0.21	0	0	0	0	0	0	0
54	Beech	0.13	0	0	0	0	0	0	0
55	Silver birch	0.5	1	1	0	1	1	0	1
56	Silver birch	0.17	0	0	0	0	1	0	0
57	Silver birch	0.15	0	0	0	0	0	0	0
58	Silver birch	0.37	0	1	1	0	0	0	0
59	Silver birch	0.24	0	0	1	0	0	0	0
60	Silver birch	0.18	1	1	1	0	1	0	0
61	Silver birch	0.23	1	1	0	0	0	0	0
62	Beech	0.2	0	0	0	0	1	0	0
63	Silver birch	0.26	0	0	1	1	0	0	1
64	Beech	0.12	0	0	0	1	1	0	0
65	Beech	2.13	1	1	1	1	0	0	1
66.1	Oak	1.14	2	2	3	3	3	3	3
66.2	Oak	0.28	0	0	0	0	0	1	1
67	Oak	1.17	3	2	3	3	3	2	3
68.1	Beech	0.65	2	1	2	2	1	0	2
68.2	Beech	0.52	0	2	1	1	0	0	1
68.3	Beech	0.44	0	0	1	1	0	0	1
69	Beech	2.48	fallen down	fallen down	fallen down	fallen down	fallen down	fallen down	fallen down
70	Beech	1.52	2	1	1	1	0	0	0
71	Oak	2.54	4	3	4	3	4	3	4
72	Oak	1.42	3	1	3	3	2	1	2
73	Oak	1.3	1	1	2	3	1	1	2
74	Silver birch	0.09	0	0	0	0	0	0	0
75	Silver birch	0.32	0	0	1	0	0	0	0
76	Silver birch	0.25	1	1	0	0	0	0	0
77	Silver birch	0.13	0	0	0	0	0	0	0
78	Silver birch	0.09	0	0	0	0	0	0	0
79	Oak	0.12	0	0	0	0	0	0	0
80	Silver birch	0.17	0	0	0	0	0	0	1
81	Silver birch	0.11	0	0	0	0	0	0	0
82	Beech	0.02	0	0	0	0	0	0	0
83	Oak	1.24	2	3	3	3	3	2	3
84	Silver birch	0.1	0	0	0	0	0	0	0
85	Silver birch	0.25	0	0	0	0	0	0	0
86	Silver birch	0.31	0	0	0	0	0	0	0
87	Silver birch	0.17	0	0	0	0	0	0	0
88.1	Silver birch	0.21	1	0	0	0	0	0	0
88.2	Silver birch	0.23	1	0	0	0	1	0	0
88.3	Silver birch	0.13	1	0	0	0	0	0	0
89	Silver birch	0.28	1	1	0	0	0	0	0
90	Silver birch	0.18	0	0	0	1	0	0	0
91	Silver birch	0.22	1	0	1	0	0	0	0
92	Whitebeam	0.08	0	0	0	0	0	0	0
93	Silver birch	0.08	0	0	0	0	0	0	0
94	Silver birch	0.08	0	0	0	0	0	0	0
95	Silver birch	0.15	0	0	0	0	0	0	0
96	Silver birch	0.28	0	0	0	0	0	0	0
97	Whitebeam	0.09	0	0	0	0	0	0	0
98	Silver birch	0.16	0	0	0	0	0	0	0
99	Silver birch	0.08	0	0	0	0	0	0	0
100	Silver birch	0.22	0	0	0	0	0	0	0

Tree No.	Species	Girth /m	27/09/95	11/10/95	18/10/95	25/10/95	01/11/95	08/11/95	15/11/95
51	Oak	1.51	0	1	0	0	1	0	0
52	Silver birch	0.25	1	0	1	0	0	0	0
53	Silver birch	0.21	0	0	0	0	0	0	0
54	Beech	0.13	0	0	0	0	0	0	0
55	Silver birch	0.5	0	1	0	1	1	0	0
56	Silver birch	0.17	0	0	0	0	0	0	0
57	Silver birch	0.15	0	0	1	0	0	0	0
58	Silver birch	0.37	0	0	0	0	0	0	0
59	Silver birch	0.24	0	0	0	1	0	0	0
60	Silver birch	0.18	0	0	0	0	0	0	0
61	Silver birch	0.23	0	0	1	1	0	0	0
62	Beech	0.2	1	1	0	2	0	0	0
63	Silver birch	0.26	0	0	0	0	0	0	0
64	Beech	0.12	1	1	1	1	0	1	1
65	Beech	2.13	1	1	0	1	1	1	0
66.1	Oak	1.14	3	3	3	2	2	2	1
66.2	Oak	0.28	1	1	0	0	0	0	0
67	Oak	1.17	1	2	1	2	2	1	0
68.1	Beech	0.65	1	1	0	0	1	0	0
68.2	Beech	0.52	0	1	0	1	0	0	0
68.3	Beech	0.44	0	0	0	0	0	0	0
69	Beech	2.48	fallen down	fallen down	fallen down	fallen down	fallen down	fallen down	fallen down
70	Beech	1.52	0	1	0	1	1	1	0
71	Oak	2.54	3	3	3	2	3	2	1
72	Oak	1.42	1	1	0	0	1	0	0
73	Oak	1.3	1	1	1	1	2	1	0
74	Silver birch	0.09	0	0	0	0	0	0	0
75	Silver birch	0.32	0	0	0	0	0	0	0
76	Silver birch	0.25	0	0	0	0	0	0	0
77	Silver birch	0.13	0	0	0	0	0	0	0
78	Silver birch	0.09	0	0	0	0	0	0	0
79	Oak	0.12	0	1	0	1	0	1	0
80	Silver birch	0.17	0	0	0	0	0	0	0
81	Silver birch	0.11	0	0	0	0	0	0	0
82	Beech	0.02	0	0	0	0	0	0	0
83	Oak	1.24	2	2	2	2	1	1	.0
84	Silver birch	0.1	0	0	0	0	0	0	0
85	Silver birch	0.25	0	0	0	0	0	0	0
86	Silver birch	0.31	0	0	0	0	0	0	0
87	Silver birch	0.17	0	0	0	0	0	0	0
88.1	Silver birch	0.21	0	0	0	0	0	0	0
88.2	Silver birch	0.23	0	0	0	0	0	0	0
88.3	Silver birch	0.13	0	0	1	0	0	0	0
89	Silver birch	0.28	0	0	0	0	0	0	0
90	Silver birch	0.18	0	0	0	0	0	0	0
91	Silver birch	0.22	0	0	0	0	0	0	0
92	Whitebeam	0.08	0	0	0	0	0	0	0
93	Silver birch	0.08	0	0	0	0	0	0	0
94	Silver birch	0.08	0	0	0	1	0	0	0
95	Silver birch	0.15	0	0	0	1	0	0	0
96	Silver birch	0.28	0	0	0	1	0	0	0
97	Whitebeam	0.09	0	0	0	0	0	0	0
98	Silver birch	0.16	0	0	0	0	0	0	0
99	Silver birch	0.08	0	0	0	0	0	0	0
100	Silver birch	0.22	0	0	0	0	1	0	0

Tree No.	Species	Girth /m	22/11/95	29/11/95
51	Oak	1.51	0	0
52	Silver birch	0.25	0	0
53	Silver birch	0.21	0	0
54	Beech	0.13	0	0
55	Silver birch	0.5	0	0
56	Silver birch	0.17	0	0
57	Silver birch	0.15	0	0
58	Silver birch	0.37	0	0
59	Silver birch	0.24	0	0
60	Silver birch	0.18	0	0
61	Silver birch	0.23	0	0
62	Beech	0.2	0	0
63	Silver birch	0.26	0	0
64	Beech	0.12	0	0
65	Beech	2.13	0	0
66.1	Oak	1.14	0	0
66.2	Oak	0.28	0	0
67	Oak	1.17	0	0
68.1	Beech	0.65	0	0
68.2	Beech	0.52	0	0
68.3	Beech	0.44	0	0
69	Beech	2.48	fallen down	fallen down
70	Beech	1.52	0	1
71	Oak	2.54	1	0
72	Oak	1.42	0	0
73	Oak	1.3	0	0
74	Silver birch	0.09	0	0
75	Silver birch	0.32	0	0
76	Silver birch	0.25	0	0
77	Silver birch	0.13	0	0
78	Silver birch	0.09	0	0
79	Oak	0.12	0	0
80	Silver birch	0.17	0	0
81	Silver birch	0.11	0	0
82	Beech	0.02	0	0
83	Oak	1.24	1	0
84	Silver birch	0.1	0	0
85	Silver birch	0.25	0	0
86	Silver birch	0.31	0	0
87	Silver birch	0.17	0	0
88.1	Silver birch	0.21	0	0
88.2	Silver birch	0.23	0	0
88.3	Silver birch	0.13	0	0
89	Silver birch	0.28	0	0
90	Silver birch	0.18	0	0
91	Silver birch	0.22	0	0
92	Whitebeam	0.08	0	0
93	Silver birch	0.08	0	0
94	Silver birch	0.08	0	0
95	Silver birch	0.15	0	0
96	Silver birch	0.28	0	0
97	Whitebeam	0.09	0	0
98	Silver birch	0.16	0	0
99	Silver birch	0.08	0	0
100	Silver birch	0.22	0	0

Dimsdale grid 1, trees 51 to 100 (1996)

Tree No.	Species	Girth /m	10/01/96	17/01/96	31/01/96	14/02/96	28/02/96	13/03/96	27/03/96
51	Oak	1.51	0	0	0	0	0	0	0
52	Silver birch	0.25	0	0	0	0	0	0	0
53	Silver birch	0.21	0	0	0	0	0	0	0
54	Beech	0.13	0	0	0	0	0	0	0
55	Silver birch	0.5	0	0	0	0	0	0	0
56	Silver birch	0.17	0	0	0	0	0	0	0
57	Silver birch	0.15	0	0	0	0	0	0	0
58	Silver birch	0.37	0	0	0	0	0	0	0
59	Silver birch	0.24	0	0	0	0	0	0	0
60	Silver birch	0.18	0	0	0	0	0	0	0
61	Silver birch	0.23	0	0	0	0	0	0	0
62	Beech	0.2	0	0	0	0	0	0	0
63	Silver birch	0.26	0	0	0	0	0	0	0
64	Beech	0.12	0	0	0	0	0	0	0
65	Beech	2.13	0	0	0	0	0	0	0
66.1	Oak	1.14	0	0	0	0	0	0	0
66.2	Oak	0.28	0	0	0	0	0	0	0
67	Oak	1.17	0	0	0	0	0	0	0
68.1	Beech	0.65	0	0	0	0	0	0	0
68.2	Beech	0.52	0	0	0	0	0	0	0
68.3	Beech	0.44	0	0	0	0	0	0	0
69	Beech	2.48	fallen down	fallen down	fallen down	fallen down	fallen down	fallen down	fallen down
70	Beech	1.52	0	0	0	0	0	0	0
71	Oak	2.54	0	0	0	0	0	0	0
72	Oak	1.42	0	0	0	0	0	0	0
73	Oak	1.3	0	0	0	0	0	0	0
74	Silver birch	0.09	0	0	0	0	0	0	0
75	Silver birch	0.32	0	0	0	0	0	0	0
76	Silver birch	0.25	0	0	0	0	0	0	0
77	Silver birch	0.13	0	0	0	0	0	0	0
78	Silver birch	0.09	0	0	0	0	0	0	0
79	Oak	0.12	0	0	0	0	0	0	0
80	Silver birch	0.17	0	0	0	0	0	0	0
81	Silver birch	0.11	0	0	0	0	0	0	0
82	Beech	0.02	0	0	0	0	0	0	0
83	Oak	1.24	0	0	0	0	0	0	0
84	Silver birch	0.1	0	0	0	0	0	0	0
85	Silver birch	0.25	0	0	0	0	0	0	0
86	Silver birch	0.31	0	0	0	0	0	0	0
87	Silver birch	0.17	0	0	0	0	0	0	0
88.1	Silver birch	0.21	0	0	0	0	0	0	0
88.2	Silver birch	0.23	0	0	0	0	0	0	0
88.3	Silver birch	0.13	0	0	0	0	0	0	0
89	Silver birch	0.28	0	0	0	0	0	0	0
90	Silver birch	0.18	0	0	0	0	0	0	0
91	Silver birch	0.22	0	0	0	0	0	0	0
92	Whitebeam	0.08	0	0	0	0	0	0	0
93	Silver birch	0.08	0	0	0	0	0	0	0
94	Silver birch	0.08	0	0	0	0	0	0	0
95	Silver birch	0.15	0	0	0	0	0	0	0
96	Silver birch	0.28	0	0	0	0	0	0	0
97	Whitebeam	0.09	0	0	0	0	0	0	0
98	Silver birch	0.16	0	0	0	0	0	0	0
99	Silver birch	0.08	0	0	0	0	0	0	0
100	Silver birch	0.22	0	0	0	0	0	0	0

Tree No.	Species	Girth /m	03/04/96	17/04/96	01/05/96	15/05/96	22/05/96	02/06/96	24/06/96	26/06/96
51	Oak	1.51	1	0	1	3	2	2	3	3
52	Silver birch	0.25	0	0	1	1	0	1	0	1
53	Silver birch	0.21	0	0	1	1	0	0	1	1
54	Beech	0.13	0	0	0	0	0	1	1	1
55	Silver birch	0.5	1	1	2	2	1	2	2	1
56	Silver birch	0.17	0	0	1	1	0	0	1	1
57	Silver birch	0.15	0	0	1	0	0	1	0	0
58	Silver birch	0.37	0	1	2	2	1	1	2	1
59	Silver birch	0.24	0	1	0	1	1	1	1	1
60	Silver birch	0.18	0	1	1	0	0	0	1	1
61	Silver birch	0.23	0	0	1	1	1	2	1	1
62	Beech	0.2	1	0	1	0	0	1	0	0
63	Silver birch	0.26	1	0	1	0	1	1	0	0
64	Beech	0.12	0	0	0	1	0	1	0	1
65	Beech	2.13	0	0	0	2	1	1	1	1
66.1	Oak	1.14	0	0	2	4	3	3	3	3
66.2	Oak	0.28	0	0	0	2	1	1	1	0
67	Oak	1.17	0	0	1	4	3	3	3	2
68.1	Beech	0.65	0	0	0	1	1	1	0	1
68.2	Beech	0.52	0	0	0	1	0	1	0	1
68.3	Beech	0.44	0	0	0	1	0	2	0	0
69	Beech	2.48	fallen down	fallen down	fallen down	fallen down	fallen down	fallen down	fallen down	fallen down
70	Beech	1.52	0	0	0	2	1	1	1	1
71	Oak	2.54	0	1	4	5	4	4	3	3
72	Oak	1.42	0	0	1	3	2	3	1	1
73	Oak	1.3	1	0	1	3	2	4	2	1
74	Silver birch	0.09	0	0	0	0	0	0	0	0
75	Silver birch	0.32	0	1	0	1	0	0	0	0
76	Silver birch	0.25	0	0	0	0	0	0	0	1
77	Silver birch	0.13	0	0	0	1	0	0	0	1
78	Silver birch	0.09	0	0	0	0	0	0	0	0
79	Oak	0.12	0	0	0	0	1	1	0	0
80	Silver birch	0.17	0	0	0	0	0	0	1	1
81	Silver birch	0.11	0	0	0	0	0	0	0	0
82	Beech	0.02	0	0	0	0	0	0	0	1
83	Oak	1.24	0	0	1	3	2	3	3	3
84	Silver birch	0.1	0	0	0	1	0	1	0	0
85	Silver birch	0.25	0	1	0	1	0	1	1	0
86	Silver birch	0.31	0	0	1	1	0	1	2	1
87	Silver birch	0.17	0	0	0	0	0	0	1	1
88.1	Silver birch	0.21	0	1	0	1	0	1	1	1
88.2	Silver birch	0.23	0	1	0	1	0	1	1	1
88.3	Silver birch	0.13	0	0	0	1	0	0	0	0
89	Silver birch	0.28	0	0	1	0	0	0	0	1
90	Silver birch	0.18	0	2	1	0	0	0	0	1
91	Silver birch	0.22	0	1	0	0	0	0	0	0
92	Whitebeam	0.08	0	0	0	0	0	0	0	0
93	Silver birch	0.08	0	0	0	0	0	0	0	0
94	Silver birch	0.08	0	0	0	0	0	1	0	1
95	Silver birch	0.15	0	2	0	0	0	0	0	0
96	Silver birch	0.28	0	0	0	1	0	0	1	0
97	Whitebeam	0.09	0	0	0	0	0	0	0	0
98	Silver birch	0.16	0	0	0	0	0	0	0	1
99	Silver birch	0.08	0	0	0	0	0	0	0	0
100	Silver birch	0.22	0	0	0	1	0	0	0	0

Dimsdale grid 1, trees 101 to 148 (1994)

Tree No.	Species	Girth /m	19/04/94	02/06/94	16/06/94	30/06/94	14/07/94	28/07/94	12/08/94
101	Silver birch	0.21	0	1	1	1	0	0	0
102	Silver birch	0.12	0	1	0	1	0	0	0
103	Beech	0.05	0	1	0	1	0	0	0
104	Silver birch	0.21	1	2	1	1	0	0	0
105	Oak	1.62	3	3	4	5	5	3	4
106	Oak	1.64	4	5	5	5	5	4	4
107	Beech	0.3	1	0	0	1	0	0	0
108.1	Beech	0.35	1	1	2	3	2	1	2
108.2	Beech	0.72	1	0	1	2	1	1	0
108.3	Beech	0.19	0	0	0	0	0	0	0
108.4	Beech	0.5	0	1	0	1	1	0	1
108.5	Beech	0.41	0	0	0	1	1	0	0
109.1	Beech	0.8	1	1	2	1	1	0	0
109.2	Beech	0.64	1	1	1	1	1	0	0
109.3	Beech	0.66	1	0	1	1	0	0	0
110	Oak	1.33	2	2	3	4	4	3	3
111	Oak	1.69	2	3	4	5	5	4	4
112	Holly	0.39	1	1	1	1	1	0	0
113	Holly	0.34	1	0	1	1	0	0	0
114	Holly	0.24	1	0	0	0	0	0	0
115	Holly	0.15	0	0	0	1	0	0	0
116	Holly	0.15	0	0	0	0	0	0	0
117	Holly	0.1	0	0	0	0	0	0	0
118	Holly	0.34	1	0	1	1	0	0	0
119	Holly	0.33	0	0	1	1	1	0	0
120	Holly	0.1	0	0	1	0	0	0	0
121	Beech	1.25	1	1	2	3	3	2	2
122.1	Beech	0.58	0	1	2	2	0	1	1
122.2	Beech	1.88	1	1	3	3	3	3	2
123	Beech	2.09	1	1	2	2	1	1	0
124	Beech	1.82	1	2	3	3	1	0	1
125	Beech	1.17	1	1	1	3	1	0	1
126	Oak	0.83	0	2	2	2	2	0	0
127	Beech	0.03	1	1	1	1	1	0	1
128	Silver birch	0.3	2	5	4	3	2	2	1
129	Silver birch	0.08	2	1	2	2	1	1	0
130	Silver birch	0.2	1	2	2	2	2	1	1
131	Silver birch	0.06	2	2	2	1	1	1	0
132	Silver birch	0.15	2	2	2	2	1	0	1
133	Silver birch	0.25	2	4	4	3	1	1	0
134	Silver birch	0.07	1	2	2	1	0	0	1
135	Silver birch	0.33	2	4	4	4	3	2	1
136	Silver birch	0.27	1	3	2	3	1	0	0
137	Silver birch	0.12	1	1	1	0	1	0	1
138	Silver birch	0.12	0	1	1	1	1	0	0
139	Silver birch	0.19	1	2	2	3	2	1	0
140	Silver birch	0.36	2	4	4	4	3	2	1
141	Whitebeam	0.05	1	1	1	1	1	1	0
142	Silver birch	0.09	0	1	1	1	1	0	0
143	Silver birch	0.43	2	5	4	3	3	2	1
144	Holly	0.13	1	1	2	2	1	1	0
145	Holly	0.21	1	2	2	2	1	1	1
146	Silver birch	0.17	2	2	2	2	2	1	0
147	Silver birch	0.09	2	1	1	1	1	1	0
148	Silver birch	0.05	1	1	1	0	0	1	0

Tree No.	Species	Girth /m	02/09/94	16/09/94	27/10/94	10/11/94	23/11/94	09/12/94
101	Silver birch	0.21	0	0	0	0	0	0
102	Silver birch	0.12	0	0	0	0	0	0
103	Beech	0.05	0	0	0	0	0	0
104	Silver birch	0.21	1	3	0	0	0	0
105	Oak	1.62	5	3	3	1	1	0
106	Oak	1.64	5	0	3	2	2	0
107	Beech	0.3	0	0	0	0	0	0
108.1	Beech	0.35	1	0	0	0	1	0
108.2	Beech	0.72	0	0	0	0	0	0
108.3	Beech	0.19	0	0	0	0	0	0
108.4	Beech	0.5	1	0	0	0	0	0
108.5	Beech	0.41	0	0	0	0	0	0
109.1	Beech	0.8	0	0	0	0	1	0
109.2	Beech	0.64	0	0	0	0	0	0
109.3	Beech	0.66	0	0	0	0	0	0
110	Oak	1.33	3	3	2	0	1	0
111	Oak	1.69	4	3	0	0	0	0
112	Holly	0.39	0	0	0	0	0	0
113	Holly	0.34	0	0	1	0	1	0
114	Holly	0.24	0	0	1	0	0	0
115	Holly	0.15	0	0	0	0	1	0
116	Holly	0.15	0	0	0	0	0	0
117	Holly	0.1	0	0	0	0	0	0
118	Holly	0.34	0	0	0	0	0	0
119	Holly	0.33	0	0	0	0	0	0
120	Holly	0.1	0	0	0	0	0	0
121	Beech	1.25	2	1	0	0	1	0
122.1	Beech	0.58	3	2	1	0	0	0
122.2	Beech	1.88	2	2	0	0	1	0
123	Beech	2.09	0	1	1	0	1	0
124	Beech	1.82	1	1	1	0	0	0
125	Beech	1.17	0	1	0	0	1	0
126	Oak	0.83	1	1	0	0	0	0
127	Beech	0.03	0	0	0	0	0	0
128	Silver birch	0.3	1	0	0	0	1	0
129	Silver birch	0.08	0	0	0	0	1	0
130	Silver birch	0.2	0	1	1	1	1	0
131	Silver birch	0.06	0	0	0	0	0	0
132	Silver birch	0.15	1	1	0	0	1	0
133	Silver birch	0.25	1	1	1	0	1	0
134	Silver birch	0.07	0	0	0	0	1	0
135	Silver birch	0.33	0	0	0	0	2	0
136	Silver birch	0.27	0	0	0	0	0	0
137	Silver birch	0.12	1	0	0	0	0	0
138	Silver birch	0.12	0	1	0	0	0	0
139	Silver birch	0.19	1	0	0	0	0	0
140	Silver birch	0.36	1	1	1	0	3	0
141	Whitebeam	0.05	1	0	0	0	1	0
142	Silver birch	0.09	1	0	0	0	0	0
143	Silver birch	0.43	2	1	1	0	1	0
144	Holly	0.13	1	0	0	0	1	0
145	Holly	0.21	1	1	0	0	1	0
146	Silver birch	0.17	1	0	0	1	1	0
147	Silver birch	0.09	0	0	0	1	0	0
148	Silver birch	0.05	0	0	0	0	1	0

Dimsdale grid 1, trees 101 to 148 (1995)

Tree No.	Species	Girth /m	04/01/95	08/02/95	08/03/95	22/03/95	07/04/95	12/04/95	20/04/95
101	Silver birch	0.21	0	0	0	0	0	0	0
102	Silver birch	0.12	0	0	0	0	0	0	0
103	Beech	0.05	0	0	0	0	0	0	0
104	Silver birch	0.21	0	0	0	0	1	0	0
105	Oak	1.62	0	0	0	0	4	3	3
106	Oak	1.64	0	0	0	1	4	4	3
107	Beech	0.3	0	0	0	0	0	0	0
108.1	Beech	0.35	0	0	0	0	1	2	2
108.2	Beech	0.72	0	0	0	0	1	2	2
108.3	Beech	0.19	0	0	0	0	0	0	1
108.4	Beech	0.5	0	0	0	0	1	2	2
108.5	Beech	0.41	0	0	0	0	1	0	0
109.1	Beech	0.8	0	0	0	0	1	0	0
109.2	Beech	0.64	0	0	0	0	1	1	1
109.3	Beech	0.66	0	0	0	0	1	0	0
110	Oak	1.33	0	0	0	0	3	3	3
111	Oak	1.69	0	0	0	0	3	3	3
112	Holly	0.39	0	0	0	0	1	1	0
113	Holly	0.34	0	0	0	0	1	1	0
114	Holly	0.24	0	0	0	0	0	0	1
115	Holly	0.15	0	0	0	0	0	0	0
116	Holly	0.15	0	0	0	0	0	0	0
117	Holly	0.1	0	0	0	0	0	0	0
118	Holly	0.34	0	0	0	0	0	1	0
119	Holly	0.33	0	0	0	0	0	0	2
120	Holly	0.1	0	0	0	0	0	0	1
121	Beech	1.25	0	0	0	1	1	0	1
122.1	Beech	0.58	0	0	0	0	1	1	1
122.2	Beech	1.88	0	0	0	0	1	1	0
123	Beech	2.09	0	0	0	0	0	1	1
124	Beech	1.82	0	0	0	0	0	1	2
125	Beech	1.17	0	0	0	0	1	0	1
126	Oak	0.83	0	0	0	0	0	1	0
127	Beech	0.03	0	0	0	0	0	0	0
128	Silver birch	0.3	0	0	0	0	1	1	1
129	Silver birch	0.08	0	0	0	0	0	0	0
130	Silver birch	0.2	0	0	0	1	0	0	1
131	Silver birch	0.06	0	0	0	0	0	0	0
132	Silver birch	0.15	0	0	0	0	0	1	0
133	Silver birch	0.25	0	0	0	2	0	1	1
134	Silver birch	0.07	0	0	0	0	1	0	0
135	Silver birch	0.33	0	0	0	1	1	1	1
136	Silver birch	0.27	0	0	0	0	1	1	0
137	Silver birch	0.12	0	0	0	0	1	1	0
138	Silver birch	0.12	0	0	0	0	0	1	0
139	Silver birch	0.19	0	0	0	0	1	1	1
140	Silver birch	0.36	0	0	0	1	2	0	1
141	Whitebeam	0.05	0	0	0	0	0	0	1
142	Silver birch	0.09	0	0	0	0	0	0	0
143	Silver birch	0.43	0	0	0	0	2	2	2
144	Holly	0.13	0	0	0	0	0	0	1
145	Holly	0.21	0	0	0	0	2	0	2
146	Silver birch	0.17	0	0	0	0	1	0	0
147	Silver birch	0.09	0	0	0	0	0	0	0
148	Silver birch	0.05	0	0	0	0	0	0	0

Tree No.	Species	Girth /m	04/05/95	11/05/95	18/05/95	24/05/95	31/05/95	08/06/95	13/06/95
101	Silver birch	0.21	0	0	0	1	0	0	0
102	Silver birch	0.12	0	0	0	0	0	0	1
103	Beech	0.05	0	0	0	0	0	1	0
104	Silver birch	0.21	0	0	0	0	0	0	1
105	Oak	1.62	3	3	3	3	3	3	3
106	Oak	1.64	3	3	3	3	3	3	3
107	Beech	0.3	0	0	1	0	0	0	0
108.1	Beech	0.35	2	2	2	2	1	0	0
108.2	Beech	0.72	2	1	1	1	1	0	0
108.3	Beech	0.19	1	0	0	1	1	0	0
108.4	Beech	0.5	1	0	0	0	0	0	0
108.5	Beech	0.41	0	0	1	0	0	0	0
109.1	Beech	0.8	1	0	0	0	0	1	1
109.2	Beech	0.64	0	0	0	0	0	0	0
109.3	Beech	0.66	0	0	0	0	0	0	0
110	Oak	1.33	3	2	2	3	3	2	3
111	Oak	1.69	3	3	3	3	3	3	3
112	Holly	0.39	0	0	0	0	0	0	0
113	Holly	0.34	1	1	0	0	0	0	0
114	Holly	0.24	0	0	0	0	0	0	0
115	Holly	0.15	0	0	0	0	0	0	0
116	Holly	0.15	1	0	0	0	0	0	0
117	Holly	0.1	0	0	0	0	0	1	0
118	Holly	0.34	0	0	0	0	0	0	0
119	Holly	0.33	0	0	0	0	0	0	0
120	Holly	0.1	0	0	0	0	0	0	0
121	Beech	1.25	1	0	0	1	0	1	0
122.1	Beech	0.58	2	1	0	1	1	1	2
122.2	Beech	1.88	1	0	1	1	1	2	1
123	Beech	2.09	1	0	0	0	1	1	0
124	Beech	1.82	2	0	1	1	1	1	1
125	Beech	1.17	1	0	0	1	1	1	1
126	Oak	0.83	1	1	1	1	1	0	1
127	Beech	0.03	0	1	0	0	0	0	0
128	Silver birch	0.3	1	1	3	0	2	2	2
129	Silver birch	0.08	0	0	1	0	1	1	1
130	Silver birch	0.2	0	1	0	1	1	1	1
131	Silver birch	0.06	0	0	0	2	1	1	1
132	Silver birch	0.15	0	1	1	1	1	1	1
133	Silver birch	0.25	1	2	2	2	2	2	1
134	Silver birch	0.07	0	0	0	0	0	1	0
135	Silver birch	0.33	1	1	1	1	1	2	1
136	Silver birch	0.27	0	0	0	1	0	2	2
137	Silver birch	0.12	0	0	1	0	0	1	0
138	Silver birch	0.12	0	1	0	0	1	2	0
139	Silver birch	0.19	0	0	0	0	0	1	2
140	Silver birch	0.36	1	2	3	3	2	2	2
141	Whitebeam	0.05	0	1	1	0	0	1	1
142	Silver birch	0.09	0	1	0	1	0	1	0
143	Silver birch	0.43	1	2	3	2	0	2	2
144	Holly	0.13	1	0	1	2	1	1	1
145	Holly	0.21	2	0	1	2	3	2	1
146	Silver birch	0.17	0	0	1	1	0	1	0
147	Silver birch	0.09	0	0	1	0	0	1	1
148	Silver birch	0.05	0	0	0	0	0	0	0

Tree No.	Species	Girth /m	21/06/95	28/06/95	05/07/95	12/07/95	19/07/95	26/07/95	03/08/95
101	Silver birch	0.21	1	1	1	1	1	1	1
102	Silver birch	0.12	0	0	1	0	0	1	0
103	Beech	0.05	0	0	1	0	0	0	0
104	Silver birch	0.21	0	1	1	0	0	0	0
105	Oak	1.62	3	3	3	3	3	3	3
106	Oak	1.64	4	3	3	3	3	4	3
107	Beech	0.3	1	1	0	1	1	1	0
108.1	Beech	0.35	2	2	2	2	2	2	2
108.2	Beech	0.72	1	1	2	1	0	1	1
108.3	Beech	0.19	1	1	0	1	0	0	0
108.4	Beech	0.5	1	1	1	1	0	2	0
108.5	Beech	0.41	1	1	1	1	0	2	1
109.1	Beech	0.8	1	1	2	1	1	1	1
109.2	Beech	0.64	1	1	1	1	1	1	0
109.3	Beech	0.66	1	1	1	1	1	1	1
110	Oak	1.33	2	2	2	2	2	2	3
111	Oak	1.69	2	3	2	2	2	2	3
112	Holly	0.39	0	0	1	1	0	1	1
113	Holly	0.34	0	0	1	1	0	0	0
114	Holly	0.24	0	1	1	1	1	1	0
115	Holly	0.15	0	0	0	0	0	0	0
116	Holly	0.15	0	0	1	0	0	0	0
117	Holly	0.1	0	0	0	0	0	1	0
118	Holly	0.34	1	0	0	0	2	1	1
119	Holly	0.33	0	1	0	1	1	1	1
120	Holly	0.1	0	0	0	0	0	0	0
121	Beech	1.25	1	1	2	1	2	1	1
122.1	Beech	0.58	1	1	2	2	1	1	1
122.2	Beech	1.88	1	2	2	1	2	2	2
123	Beech	2.09	1	1	3	2	3	2	1
124	Beech	1.82	1	2	2	1	3	2	2
125	Beech	1.17	1	1	2	1	1	2	0
126	Oak	0.83	1	1	1	1	1	1	0
127	Beech	0.03	0	1	0	1	1	1	0
128	Silver birch	0.3	2	1	1	2	1	1	1
129	Silver birch	0.08	1	1	0	1	1	0	0
130	Silver birch	0.2	1	1	1	1	0	0	0
131	Silver birch	0.06	1	0	0	0	0	0	1
132	Silver birch	0.15	1	1	0	1	1	1	0
133	Silver birch	0.25	1	1	2	2	1	1	0
134	Silver birch	0.07	1	0	0	1	0	0	0
135	Silver birch	0.33	1	2	1	1	2	2	2
136	Silver birch	0.27	1	1	0	1	1	1	0
137	Silver birch	0.12	1	0	0	0	0	0	0
138	Silver birch	0.12	1	1	0	0	1	1	0
139	Silver birch	0.19	1	2	2	0	2	2	0
140	Silver birch	0.36	1	3	2	2	2	2	1
141	Whitebeam	0.05	0	1	0	0	0	0	0
142	Silver birch	0.09	1	0	1	0	0	0	1
143	Silver birch	0.43	2	1	2	2	2	1	1
144	Holly	0.13	0	1	1	1	1	1	1
145	Holly	0.21	0	1	1	1	1	2	0
146	Silver birch	0.17	0	1	2	1	1	2	0
147	Silver birch	0.09	0	0	1	0	1	0	0
148	Silver birch	0.05	0	0	0	0	1	0	0

Tree No.	Species	Girth /m	09/08/95	16/08/95	23/08/95	30/08/95	06/09/95	13/09/95	20/09/95
101	Silver birch	0.21	0	0	0	0	0	0	0
102	Silver birch	0.12	0	0	0	0	0	0	0
103	Beech	0.05	0	0	0	0	0	0	0
104	Silver birch	0.21	0	0	0	0	0	0	0
105	Oak	1.62	2	1	2	3	2	3	3
106	Oak	1.64	2	0	3	3	3	3	3
107	Beech	0.3	0	0	0	0	0	0	1
108.1	Beech	0.35	1	1	2	2	2	1	3
108.2	Beech	0.72	1	1	1	0	0	0	2
108.3	Beech	0.19	1	0	0	0	0	0	0
108.4	Beech	0.5	1	0	0	0	0	0	1
108.5	Beech	0.41	1	0	1	0	0	0	1
109.1	Beech	0.8	0	0	1	1	0	0	1
109.2	Beech	0.64	0	0	0	0	0	0	0
109.3	Beech	0.66	0	0	0	0	0	0	0
110	Oak	1.33	1	2	2	3	3	1	3
111	Oak	1.69	1	3	3	3	2	2	3
112	Holly	0.39	0	0	0	0	0	0	0
113	Holly	0.34	0	0	0	1	0	0	0
114	Holly	0.24	0	0	0	0	0	0	0
115	Holly	0.15	0	0	0	0	0	0	0
116	Holly	0.15	0	0	0	0	0	0	0
117	Holly	0.1	0	0	0	0	0	0	0
118	Holly	0.34	0	0	1	0	0	0	1
119	Holly	0.33	0	0	0	1	0	0	0
120	Holly	0.1	0	0	0	0	0	0	0
121	Beech	1.25	1	2	1	1	2	1	2
122.1	Beech	0.58	1	2	0	0	2	1	2
122.2	Beech	1.88	2	1	2	2	2	2	3
123	Beech	2.09	1	2	1	1	1	0	1
124	Beech	1.82	2	2	2	2	2	1	2
125	Beech	1.17	0	1	1	1	1	0	1
126	Oak	0.83	0	0	0	0	0	0	0
127	Beech	0.03	0	1	0	0	0	0	0
128	Silver birch	0.3	0	1	1	1	1	0	1
129	Silver birch	0.08	0	0	0	0	0	0	0
130	Silver birch	0.2	0	1	1	1	0	0	0
131	Silver birch	0.06	0	0	1	1	0	0	0
132	Silver birch	0.15	0	1	0	0	0	0	1
133	Silver birch	0.25	0	1	0	0	0	0	1
134	Silver birch	0.07	0	0	0	0	0	0	0
135	Silver birch	0.33	1	1	0	1	1	0	0
136	Silver birch	0.27	0	1	0	0	1	0	0
137	Silver birch	0.12	0	0	0	0	0	0	0
138	Silver birch	0.12	0	1	0	0	0	0	0
139	Silver birch	0.19	0	1	0	0	0	0	0
140	Silver birch	0.36	0	1	1	0	0	2	1
141	Whitebeam	0.05	1	0	1	0	0	0	0
142	Silver birch	0.09	0	0	0	0	0	0	0
143	Silver birch	0.43	1	1	0	1	1	1	0
144	Holly	0.13	1	1	0	1	0	0	1
145	Holly	0.21	1	1	0	1	1	0	1
146	Silver birch	0.17	1	0	0	0	1	0	0
147	Silver birch	0.09	0	0	0	0	1	0	0
148	Silver birch	0.05	1	0	0	0	0	0	0

Tree No.	Species	Girth /m	27/09/95	11/10/95	18/10/95	25/10/95	01/11/95	08/11/95	15/11/95
101	Silver birch	0.21	0	0	0	0	0	0	0
102	Silver birch	0.12	0	0	0	0	0	0	0
103	Beech	0.05	0	0	0	0	0	0	0
104	Silver birch	0.21	0	0	0	0	0	0	0
105	Oak	1.62	2	3	3	2	2	2	1
106	Oak	1.64	2	3	3	3	3	3	1
107	Beech	0.3	0	0	0	0	0	0	0
108.1	Beech	0.35	2	3	2	1	1	0	1
108.2	Beech	0.72	1	1	0	1	1	0	0
108.3	Beech	0.19	0	0	0	0	0	0	0
108.4	Beech	0.5	0	0	0	0	0	0	0
108.5	Beech	0.41	0	0	0	0	0	0	0
109.1	Beech	0.8	0	2	1	1	1	0	0
109.2	Beech	0.64	0	0	0	0	1	0	0
109.3	Beech	0.66	0	1	0	0	1	0	0
110	Oak	1.33	3	3	3	3	3	2	0
111	Oak	1.69	2	2	2	2	2	1	0
112	Holly	0.39	0	0	0	0	0	0	0
113	Holly	0.34	0	0	0	0	0	0	0
114	Holly	0.24	0	0	0	0	0	0	0
115	Holly	0.15	0	0	/	0	0	0	0
116	Holly	0.15	0	0	0	0	0	0	0
117	Holly	0.1	0	0	0	0	0	0	0
118	Holly	0.34	0	0	0	1	0	0	0
119	Holly	0.33	0	0	0	0	0	0	0
120	Holly	0.1	0	0	0	0	0	0	0
121	Beech	1.25	2	2	0	1	1	0	0
122.1	Beech	0.58	1	1	1	1	1	0	0
122.2	Beech	1.88	2	3	2	1	1	0	0
123	Beech	2.09	1	0	1	1	0	0	0
124	Beech	1.82	1	2	1	1	2	1	0
125	Beech	1.17	1	0	0	1	0	0	0
126	Oak	0.83	0	0	0	0	0	0	0
127	Beech	0.03	0	0	0	0	0	0	0
128	Silver birch	0.3	1	0	0	0	1	0	0
129	Silver birch	0.08	0	0	0	0	0	0	0
130	Silver birch	0.2	0	1	0	0	0	0	0
131	Silver birch	0.06	0	0	0	0	0	0	0
132	Silver birch	0.15	1	0	0	1	0	0	0
133	Silver birch	0.25	0	0	0	1	1	0	0
134	Silver birch	0.07	0	0	0	0	0	0	0
135	Silver birch	0.33	1	2	1	1	1	1	1
136	Silver birch	0.27	0	1	1	0	0	0	0
137	Silver birch	0.12	0	0	0	0	0	0	0
138	Silver birch	0.12	0	0	0	0	0	0	0
139	Silver birch	0.19	0	0	0	0	0	0	0
140	Silver birch	0.36	1	1	1	2	1	1	0
141	Whitebeam	0.05	0	0	0	0	0	0	0
142	Silver birch	0.09	0	0	0	1	0	0	0
143	Silver birch	0.43	0	0	1	1	1	1	0
144	Holly	0.13	0	0	0	0	0	0	0
145	Holly	0.21	2	1	1	2	0	1	0
146	Silver birch	0.17	0	0	0	0	0	0	0
147	Silver birch	0.09	0	0	0	0	0	0	0
148	Silver birch	0.05	0	0	0	0	0	0	0

Tree No.	Species	Girth /m	22/11/95	29/11/95
101	Silver birch	0.21	0	0
102	Silver birch	0.12	0	0
103	Beech	0.05	0	0
104	Silver birch	0.21	0	0
105	Oak	1.62	0	0
106	Oak	1.64	1	1
107	Beech	0.3	0	0
108.1	Beech	0.35	0	0
108.2	Beech	0.72	0	0
108.3	Beech	0.19	0	0
108.4	Beech	0.5	0	0
108.5	Beech	0.41	0	0
109.1	Beech	0.8	0	0
109.2	Beech	0.64	0	0
109.3	Beech	0.66	0	0
110	Oak	1.33	0	0
111	Oak	1.69	0	0
112	Holly	0.39	0	0
113	Holly	0.34	0	0
114	Holly	0.24	0	0
115	Holly	0.15	0	0
116	Holly	0.15	0	0
117	Holly	0.1	0	0
118	Holly	0.34	0	0
119	Holly	0.33	0	0
120	Holly	0.1	0	0
121	Beech	1.25	0	0
122.1	Beech	0.58	0	0
122.2	Beech	1.88	0	0
123	Beech	2.09	0	1
124	Beech	1.82	0	0
125	Beech	1.17	0	0
126	Oak	0.83	0	0
127	Beech	0.03	0	0
128	Silver birch	0.3	0	0
129	Silver birch	0.08	1	0
130	Silver birch	0.2	0	0
131	Silver birch	0.06	0	0
132	Silver birch	0.15	1	0
133	Silver birch	0.25	0	0
134	Silver birch	0.07	0	0
135	Silver birch	0.33	0	0
136	Silver birch	0.27	0	0
137	Silver birch	0.12	0	0
138	Silver birch	0.12	0	0
139	Silver birch	0.19	0	0
140	Silver birch	0.36	1	1
141	Whitebeam	0.05	0	0
142	Silver birch	0.09	0	0
143	Silver birch	0.43	1	0
144	Holly	0.13	0	0
145	Holly	0.21	1	0
146	Silver birch	0.17	0	1
147	Silver birch	0.09	0	1
148	Silver birch	0.05	0	0

Dimsdale grid 1, trees 101 to 148 (1996)

Tree No.	Species	Girth /m	10/01/96	17/01/96	31/01/96	14/02/96	28/02/96	13/03/96	27/03/96
101	Silver birch	0.21	0	0	0	0	0	0	0
102	Silver birch	0.12	0	0	0	0	0	0	0
103	Beech	0.05	0	0	0	0	0	0	0
104	Silver birch	0.21	0	0	0	0	0	0	0
105	Oak	1.62	0	0	0	0	0	0	0
106	Oak	1.64	0	0	0	0	0	0	0
107	Beech	0.3	0	0	0	0	0	0	0
108.1	Beech	0.35	0	0	0	0	0	0	0
108.2	Beech	0.72	0	0	0	0	0	0	0
108.3	Beech	0.19	0	0	0	0	0	0	0
108.4	Beech	0.5	0	0	0	0	0	0	0
108.5	Beech	0.41	0	0	0	0	0	0	0
109.1	Beech	0.8	0	0	0	0	0	0	0
109.2	Beech	0.64	0	0	0	0	0	0	0
109.3	Beech	0.66	0	0	0	0	0	0	0
110	Oak	1.33	0	0	0	0	0	0	0
111	Oak	1.69	0	0	0	0	0	0	0
112	Holly	0.39	0	0	0	0	0	0	0
113	Holly	0.34	0	0	0	0	0	0	0
114	Holly	0.24	0	0	0	0	0	0	0
115	Holly	0.15	0	0	0	0	0	0	0
116	Holly	0.15	0	0	0	0	0	0	0
117	Holly	0.1	0	0	0	0	0	0	0
118	Holly	0.34	0	0	0	0	0	0	0
119	Holly	0.33	0	0	0	0	0	0	0
120	Holly	0.1	0	0	0	0	0	0	0
121	Beech	1.25	0	0	0	0	0	0	0
122.1	Beech	0.58	0	0	0	0	0	0	0
122.2	Beech	1.88	0	0	0	0	0	0	0
123	Beech	2.09	0	0	0	0	0	0	0
124	Beech	1.82	0	0	0	0	0	0	0
125	Beech	1.17	0	0	0	0	0	0	0
126	Oak	0.83	0	0	0	0	0	0	0
127	Beech	0.03	0	0	0	0	0	0	0
128	Silver birch	0.3	0	0	0	0	0	0	0
129	Silver birch	0.08	0	0	0	0	0	0	0
130	Silver birch	0.2	0	0	0	0	0	0	0
131	Silver birch	0.06	0	0	0	0	0	0	0
132	Silver birch	0.15	0	0	0	0	0	0	0
133	Silver birch	0.25	0	0	0	0	0	0	0
134	Silver birch	0.07	0	0	0	0	0	0	0
135	Silver birch	0.33	0	0	0	0	0	0	0
136	Silver birch	0.27	0	0	0	0	0	0	0
137	Silver birch	0.12	0	0	0	0	0	0	0
138	Silver birch	0.12	0	0	0	0	0	0	0
139	Silver birch	0.19	0	0	0	0	0	0	0
140	Silver birch	0.36	0	0	0	0	0	0	0
141	Whitebeam	0.05	0	0	0	0	0	0	0
142	Silver birch	0.09	0	0	0	0	0	0	0
143	Silver birch	0.43	0	0	0	0	0	0	0
144	Holly	0.13	0	0	0	0	0	0	0
145	Holly	0.21	0	0	0	0	0	0	0
146	Silver birch	0.17	0	0	0	0	0	0	0
147	Silver birch	0.09	0	0	0	0	0	0	0
148	Silver birch	0.05	0	0	0	0	0	0	0

Tree No.	Species	Girth /m	03/04/96	17/04/96	01/05/96	15/05/96	22/05/96	02/06/96	24/06/96	26/06/96
101	Silver birch	0.21	0	0	0	0	0	0	0	0
102	Silver birch	0.12	0	0	0	0	0	0	0	0
103	Beech	0.05	0	0	0	0	0	0	0	0
104	Silver birch	0.21	0	0	0	0	0	1	0	0
105	Oak	1.62	0	0	2	4	1	4	3	3
106	Oak	1.64	2	2	4	4	3	5	3	3
107	Beech	0.3	1	0	0	0	3	1	0	0
108.1	Beech	0.35	1	1	0	2	0	1	1	1
108.2	Beech	0.72	0	0	1	2	0	1	1	1
108.3	Beech	0.19	0	1	0	1	1	0	0	0
108.4	Beech	0.5	1	0	0	0	0	1	0	0
108.5	Beech	0.41	0	0	0	0	0	1	0	0
109.1	Beech	0.8	1	0	0	1	1	0	0	0
109.2	Beech	0.64	1	0	0	0	0	0	0	0
109.3	Beech	0.66	0	0	0	0	0	1	0	0
110	Oak	1.33	0	1	2	4	0	3	3	2
111	Oak	1.69	0	1	2	4	3	4	3	2
112	Holly	0.39	0	0	0	0	3	1	0	1
113	Holly	0.34	0	0	0	0	0	1	0	0
114	Holly	0.24	0	0	0	0	1	0	0	0
115	Holly	0.15	0	0	0	0	0	0	0	0
116	Holly	0.15	0	0	0	0	1	0	0	0
117	Holly	0.1	0	0	0	0	0	0	0	0
118	Holly	0.34	0	0	0	1	0	1	1	1
119	Holly	0.33	0	0	0	0	0	0	0	0
120	Holly	0.1	0	0	0	0	0	0	0	0
121	Beech	1.25	0	1	0	2	0	1	1	1
122.1	Beech	0.58	0	0	0	1	0	1	1	0
122.2	Beech	1.88	0	0	0	1	0	1	2	1
123	Beech	2.09	0	0	0	2	0	1	1	1
124	Beech	1.82	0	0	1	1	1	1	1	1
125	Beech	1.17	0	1	0	1	0	0	1	0
126	Oak	0.83	0	0	1	2	1	1	1	1
127	Beech	0.03	0	1	0	0	0	1	1	0
128	Silver birch	0.3	1	2	2	3	2	1	1	1
129	Silver birch	0.08	2	1	1	1	0	0	1	0
130	Silver birch	0.2	2	2	1	2	1	1	1	1
131	Silver birch	0.06	2	0	1	1	0	1	1	1
132	Silver birch	0.15	1	0	1	2	0	1	0	0
133	Silver birch	0.25	2	1	2	3	2	3	2	1
134	Silver birch	0.07	0	0	1	1	0	0	0	0
135	Silver birch	0.33	3	2	2	2	1	0	0	1
136	Silver birch	0.27	2	1	2	2	1	1	1	1
137	Silver birch	0.12	1	0	1	1	1	0	1	0
138	Silver birch	0.12	2	0	1	1	0	2	0	0
139	Silver birch	0.19	2	0	1	2	0	2	3	1
140	Silver birch	0.36	1	3	1	2	2	3	3	3
141	Whitebeam	0.05	1	0	2	1	0	1	0	0
142	Silver birch	0.09	0	0	1	1	1	0	0	0
143	Silver birch	0.43	1	2	3	3	2	2	3	3
144	Holly	0.13	0	1	1	1	0	1	1	1
145	Holly	0.21	1	2	2	2	2	1	2	2
146	Silver birch	0.17	1	2	1	2	1	2	1	1
147	Silver birch	0.09	1	1	0	1	0	0	1	0
148	Silver birch	0.05	1	0	0	1	0	1	0	0

Dimsdale grid 2, trees 1 to 47 (1994)

Tree No.	Species	Girth /m	23/05/94	02/06/94	16/06/94	30/06/94	14/07/94	28/07/94	12/08/94
1	Beech	1.65	1	1	2	1	0	1	0
2.1	Beech	1.11	1	1	2	1	1	1	0
2.2	Beech	1.09	1	1	2	1	1	0	0
3	Oak	1.03	4	3	4	2	3	3	3
4	Oak	0.85	4	4	4	3	3	2	1
5	Beech	0.8	2	1	2	1	2	1	1
6.1	Oak	0.93	1	3	3	3	4	3	3
6.2	Oak	0.97	2	2	2	3	3	3	3
7.1	Silver birch	0.19	2	2	2	2	1	1	0
7.2	Silver birch	0.09	1	2	2	2	1	0	0
8	Oak	0.44	2	1	1	1	0	1	0
9	Beech	0.04	0	0	1	0	0	0	0
10	Beech	1.87	1	1	2	2	3	0	0
11.1	Oak	0.54	2	1	2	1	1	1	3
11.2	Oak	0.92	3	2	3	3	2	2	2
12	Oak	1.24	4	3	4	3	4	3	3
13	Beech	1.6	1	1	2	3	3	1	3
14	Beech	1.72	0	1	1	2	1	0	1
15	Oak	1.21	4	3	3	3	4	3	3
16	Silver birch	0.12	0	0	1	1	0	0	0
17	Beech	1.02	1	0	2	1	1	1	1
18	Oak	0.36	1	1	1	1	1	1	0
19	Silver birch	0.24	1	2	2	2	1	0	1
20	Oak	1.58	4	3	4	3	3	3	3
21	Whitebeam	0.15	1	1	1	1	1	0	0
22	Beech	0.61	1	0	1	2	1	1	0
23.1	Beech	3.06	1	1	3	3	4	4	4
23.2	Beech	0.22	1	1	1	1	1	0	1
24	Beech	1.11	0	1	1	2	3	3	3
25	Oak	0.97	4	3	3	3	2	1	2
26	Beech	0.02	0	0	0	0	0	0	0
27	Beech	0.04	0	1	0	0	0	0	0
28	Beech	0.04	0	0	0	0	0	0	0
29	Beech	0.03	0	0	0	0	0	0	0
30	Beech	0.02	0	0	1	0	0	0	0
31	Beech	2.2	1	1	1	1	2	1	1
32	Beech	0.03	0	/	/	0	/	/	0
33	Beech	1.5	2	2	2	1	1	1	1
34.1	Whitebeam	0.7	2	1	2	1	1	0	1
34.2	Whitebeam	0.13	1	0	1	1	0	0	0
34.3	Whitebeam	0.13	1	1	1	1	0	0	0
35	Whitebeam	0.5	dead	dead	dead	dead	dead	dead	dead
36	Silver birch	0.25	2	1	2	2	3	0	1
37	Oak	0.12	2	1	1	1	1	0	/
38	Beech	2.08	0	1	1	2	1	0	1
39	Beech	1.06	0	1	2	2	3	0	1
40	Beech	1.16	1	2	3	2	3	2	1
41	Oak	1.04	2	3	3	3	3	3	3
42	Silver birch	0.05	3	4	4	3	3	2	2
43	Beech	0.53	1	2	3	3	4	4	4
44	Oak	0.95	4	4	4	3	5	3	3
45	Beech	0.03	0	0	1	0	0	0	0
46	Beech	0.03	0	0	0	0	0	0	0
47	Beech	0.02	0	0	0	0	0	0	0

Tree No.	Species	Girth /m	02/09/94	16/09/94	27/10/94	10/11/94	23/11/94	09/12/94
1	Beech	1.65	2	1	0	0	1	1
2.1	Beech	1.11	0	0	0	0	0	0
2.2	Beech	1.09	0	0	1	0	1	0
3	Oak	1.03	3	2	1	0	1	0
4	Oak	0.85	2	1	0	0	0	0
5	Beech	0.8	0	1	0	0	0	0
6.1	Oak	0.93	3	2	1	0	0	0
6.2	Oak	0.97	3	2	0	0	0	0
7.1	Silver birch	0.19	1	0	0	0	0	0
7.2	Silver birch	0.09	1	0	0	0	0	0
8	Oak	0.44	1	0	0	0	0	0
9	Beech	0.04	0	0	0	0	0	0
10	Beech	1.87	0	0	0	0	0	0
11.1	Oak	0.54	0	0	0	0	1	0
11.2	Oak	0.92	2	1	0	0	1	0
12	Oak	1.24	3	3	1	1	0	0
13	Beech	1.6	2	2	1	1	1	0
14	Beech	1.72	2	1	0	1	0	0
15	Oak	1.21	3	3	0	0	0	0
16	Silver birch	0.12	0	0	0	0	0	0
17	Beech	1.02	1	0	0	0	1	0
18	Oak	0.36	0	0	0	0	0	0
19	Silver birch	0.24	0	0	0	0	0	0
20	Oak	1.58	3	2	1	1	0	0
21	Whitebeam	0.15	0	0	0	0	0	0
22	Beech	0.61	0	0	0	0	0	0
23.1	Beech	3.06	3	2	1	1	1	0
23.2	Beech	0.22	0	0	0	0	0	0
24	Beech	1.11	0	3	0	1	0	0
25	Oak	0.97	2	1	0	0	0	0
26	Beech	0.02	0	0	0	1	0	0
27	Beech	0.04	0	0	0	0	0	0
28	Beech	0.04	0	1	0	0	0	0
29	Beech	0.03	0	0	0	0	0	0
30	Beech	0.02	0	0	0	0	0	0
31	Beech	2.2	2	0	0	0	1	0
32	Beech	0.03	0	0	0	0	0	0
33	Beech	1.5	1	0	1	1	3	0
34.1	Whitebeam	0.7	1	0	1	0	0	0
34.2	Whitebeam	0.13	0	0	0	0	0	0
34.3	Whitebeam	0.13	0	0	0	0	0	0
35	Whitebeam	0.5	dead	dead	dead	dead	dead	dead
36	Silver birch	0.25	2	1	1	2	2	0
37	Oak	0.12	1	0	0	0	0	0
38	Beech	2.08	0	1	0	0	1	0
39	Beech	1.06	3	2	0	0	1	1
40	Beech	1.16	1	1	0	1	1	0
41	Oak	1.04	3	3	0	1	0	0
42	Silver birch	0.05	1	1	1	2	3	0
43	Beech	0.53	4	4	3	2	3	1
44	Oak	0.95	3	3	0	1	2	0
45	Beech	0.03	0	0	0	0	0	0
46	Beech	0.03	0	0	0	0	0	0
47	Beech	0.02	0	0	0	0	0	0

Dimsdale grid 2, trees 1 to 47 (1995)

Tree No.	Species	Girth /m	04/01/95	08/02/95	08/03/95	22/03/95	07/04/95	12/04/95
1	Beech	1.65	0	0	0	1	1	1
2.1	Beech	1.11	0	0	0	1	1	1
2.2	Beech	1.09	0	0	0	1	1	2
3	Oak	1.03	0	0	0	2	4	3
4	Oak	0.85	0	0	0	1	2	2
5	Beech	0.8	0	0	0	1	1	0
6.1	Oak	0.93	0	0	0	0	2	1
6.2	Oak	0.97	0	0	0	0	2	2
7.1	Silver birch	0.19	0	0	0	0	1	1
7.2	Silver birch	0.09	0	0	0	1	1	1
8	Oak	0.44	0	0	0	1	1	0
9	Beech	0.04	0	0	0	0	0	0
10	Beech	1.87	0	0	0	2	1	1
11.1	Oak	0.54	0	0	0	2	2	1
11.2	Oak	0.92	0	0	0	2	3	2
12	Oak	1.24	0	0	0	2	3	3
13	Beech	1.6	0	0	1	2	1	1
14	Beech	1.72	0	0	0	2	1	1
15	Oak	1.21	0	0	0	0	3	3
16	Silver birch	0.12	0	0	0	0	0	0
17	Beech	1.02	0	0	0	1	1	1
18	Oak	0.36	0	0	0	1	0	2
19	Silver birch	0.24	0	0	0	0	0	1
20	Oak	1.58	0	0	0	2	3	3
21	Whitebeam	0.15	0	0	1	1	1	0
22	Beech	0.61	0	0	0	2	1	1
23.1	Beech	3.06	0	0	0	3	1	1
23.2	Beech	0.22	0	0	0	0	0	0
24	Beech	1.11	0	0	0	3	1	0
25	Oak	0.97	0	0	0	1	2	1
26	Beech	0.02	0	0	0	0	0	0
27	Beech	0.04	0	0	0	0	0	0
28	Beech	0.04	0	0	0	0	0	0
29	Beech	0.03	0	0	0	0	0	0
30	Beech	0.02	0	0	0	0	0	0
31	Beech	2.2	0	0	0	1	1	1
32	Beech	0.03	0	0	0	0	0	0
33	Beech	1.5	0	0	1	3	3	1
34.1	Whitebeam	0.7	0	0	0	1	1	1
34.2	Whitebeam	0.13	0	0	0	1	1	0
34.3	Whitebeam	0.13	0	0	0	0	0	0
35	Whitebeam	0.5	dead	dead	dead	dead	dead	dead
36	Silver birch	0.25	0	0	0	1	2	2
37	Oak	0.12	0	0	0	0	1	0
38	Beech	2.08	0	0	0	2	1	2
39	Beech	1.06	1	1	1	2	1	0
40	Beech	1.16	0	0	1	3	2	1
41	Oak	1.04	0	0	0	3	3	3
42	Silver birch	0.05	0	0	1	2	2	1
43	Beech	0.53	0	0	0	4	3	2
44	Oak	0.95	0	0	0	2	3	2
45	Beech	0.03	0	0	0	0	0	0
46	Beech	0.03	0	0	0	0	0	0
47	Beech	0.02	0	0	0	0	0	0

Tree No.	Species	Girth /m	20/04/95	04/05/95	11/05/95	18/05/95	24/05/95	31/05/95
1	Beech	1.65	1	2	0	0	1	1
2.1	Beech	1.11	1	2	0	0	1	1
2.2	Beech	1.09	2	1	0	1	1	1
3	Oak	1.03	3	3	2	3	3	3
4	Oak	0.85	3	3	2	2	2	2
5	Beech	0.8	1	1	0	1	0	1
6.1	Oak	0.93	2	3	2	3	2	3
6.2	Oak	0.97	2	3	2	2	2	3
7.1	Silver birch	0.19	2	1	1	2	1	2
7.2	Silver birch	0.09	0	0	0	0	dead	dead
8	Oak	0.44	2	1	1	2	1	2
9	Beech	0.04	0	0	0	0	0	0
10	Beech	1.87	1	1	0	0	1	2
11.1	Oak	0.54	3	1	2	3	2	1
11.2	Oak	0.92	3	2	2	3	2	3
12	Oak	1.24	3	3	3	3	3	3
13	Beech	1.6	1	1	1	2	1	1
14	Beech	1.72	1	2	0	1	1	1
15	Oak	1.21	3	3	2	3	3	3
16	Silver birch	0.12	0	1	0	0	0	0
17	Beech	1.02	2	1	1	1	1	1
18	Oak	0.36	1	1	0	1	1	1
19	Silver birch	0.24	0	0	0	0	1	1
20	Oak	1.58	3	3	3	3	3	3
21	Whitebeam	0.15	1	0	0	0	0	1
22	Beech	0.61	0	1	0	1	0	1
23.1	Beech	3.06	1	1	1	1	1	1
23.2	Beech	0.22	0	0	0	0	0	0
24	Beech	1.11	2	1	1	1	1	3
25	Oak	0.97	2	2	1	3	2	3
26	Beech	0.02	0	0	0	0	0	0
27	Beech	0.04	0	0	0	0	0	0
28	Beech	0.04	0	0	0	0	0	0
29	Beech	0.03	0	0	0	0	0	0
30	Beech	0.02	0	0	0	0	0	0
31	Beech	2.2	0	0	1	1	1	1
32	Beech	0.03	0	0	0	0	0	0
33	Beech	1.5	2	0	0	2	1	2
34.1	Whitebeam	0.7	1	1	1	1	1	1
34.2	Whitebeam	0.13	1	0	0	1	0	0
34.3	Whitebeam	0.13	0	0	0	0	0	0
35	Whitebeam	0.5	dead	dead	dead	dead	dead	dead
36	Silver birch	0.25	3	2	2	3	2	2
37	Oak	0.12	0	1	0	0	0	0
38	Beech	2.08	2	2	0	0	1	2
39	Beech	1.06	1	1	1	1	1	2
40	Beech	1.16	2	2	1	1	1	2
41	Oak	1.04	3	3	2	3	3	3
42	Silver birch	0.05	2	1	2	3	2	2
43	Beech	0.53	2	2	2	3	1	3
44	Oak	0.95	3	3	2	3	3	3
45	Beech	0.03	0	0	0	0	0	0
46	Beech	0.03	0	0	0	0	0	0
47	Beech	0.02	0	0	0	0	0	0

Tree No.	Species	Girth /m	08/06/95	13/06/95	21/06/95	28/06/95	05/97/95	12/07/95
1	Beech	1.65	1	0	1	1	1	1
2.1	Beech	1.11	0	1	1	2	1	1
2.2	Beech	1.09	1	0	1	1	1	1
3	Oak	1.03	3	1	2	2	1	1
4	Oak	0.85	1	1	1	2	1	1
5	Beech	0.8	1	0	1	1	1	1
6.1	Oak	0.93	2	2	2	2	3	3
6.2	Oak	0.97	1	2	2	2	2	2
7.1	Silver birch	0.19	2	2	0	1	1	1
7.2	Silver birch	0.09	dead	dead	dead	dead	dead	dead
8	Oak	0.44	1	1	1	1	1	1
9	Beech	0.04	0	0	0	0	0	0
10	Beech	1.87	1	0	1	1	1	2
11.1	Oak	0.54	1	2	2	1	1	1
11.2	Oak	0.92	2	2	1	2	1	1
12	Oak	1.24	3	2	3	2	1	1
13	Beech	1.6	1	1	2	2	2	2
14	Beech	1.72	1	1	1	1	1	2
15	Oak	1.21	3	2	2	2	2	2
16	Silver birch	0.12	0	0	0	0	0	0
17	Beech	1.02	1	0	1	1	1	1
18	Oak	0.36	1	2	1	1	1	0
19	Silver birch	0.24	0	1	0	1	1	1
20	Oak	1.58	3	2	2	2	1	2
21	Whitebeam	0.15	1	0	0	0	/	1
22	Beech	0.61	0	0	1	1	1	1
23.1	Beech	3.06	1	1	1	1	2	1
23.2	Beech	0.22	0	0	0	1	0	0
24	Beech	1.11	1	2	2	3	2	3
25	Oak	0.97	2	2	1	2	1	1
26	Beech	0.02	0	0	0	0	0	0
27	Beech	0.04	0	0	0	0	0	0
28	Beech	0.04	0	0	0	0	0	0
29	Beech	0.03	0	0	1	0	0	0
30	Beech	0.02	0	0	0	0	0	0
31	Beech	2.2	1	1	2	2	1	1
32	Beech	0.03	0	0	0	1	0	/
33	Beech	1.5	2	0	1	2	2	2
34.1	Whitebeam	0.7	1	1	0	1	1	1
34.2	Whitebeam	0.13	1	1	0	0	0	1
34.3	Whitebeam	0.13	1	1	0	0	0	1
35	Whitebeam	0.5	dead	dead	dead	dead	dead	dead
36	Silver birch	0.25	3	2	0	2	3	2
37	Oak	0.12	1	1	0	1	1	1
38	Beech	2.08	1	1	1	2	1	2
39	Beech	1.06	1	1	0	2	2	2
40	Beech	1.16	2	1	2	1	2	1
41	Oak	1.04	3	3	2	3	2	2
42	Silver birch	0.05	3	3	0	2	3	1
43	Beech	0.53	2	2	2	2	3	3
44	Oak	0.95	3	3	3	2	1	1
45	Beech	0.03	0	0	0	0	0	1
46	Beech	0.03	0	0	0	0	0	0
47	Beech	0.02	0	0	2	0	0	0

Tree No.	Species	Girth /m	19/07/95	26/07/95	03/08/95	09/08/95	16/08/95	23/08/95
1	Beech	1.65	1	2	0	0	0	0
2.1	Beech	1.11	1	1	0	1	0	0
2.2	Beech	1.09	1	2	0	1	0	0
3	Oak	1.03	1	2	1	1	2	2
4	Oak	0.85	1	2	0	1	1	1
5	Beech	0.8	1	1	1	1	0	0
6.1	Oak	0.93	1	2	2	1	2	2
6.2	Oak	0.97	1	2	2	1	2	2
7.1	Silver birch	0.19	1	1	0	/	1	0
7.2	Silver birch	0.09	dead	dead	dead	dead	dead	dead
8	Oak	0.44	0	1	1	1	0	0
9	Beech	0.04	0	0	1	0	0	0
10	Beech	1.87	2	3	1	1	1	0
11.1	Oak	0.54	1	2	1	1	0	1
11.2	Oak	0.92	1	2	2	2	1	1
12	Oak	1.24	1	2	1	2	1	3
13	Beech	1.6	2	3	1	0	0	1
14	Beech	1.72	2	3	1	1	1	1
15	Oak	1.21	1	2	1	1	2	2
16	Silver birch	0.12	1	0	0	0	0	0
17	Beech	1.02	1	1	0	0	0	0
18	Oak	0.36	1	0	0	0	0	0
19	Silver birch	0.24	1	1	0	0	0	0
20	Oak	1.58	1	2	2	2	3	3
21	Whitebeam	0.15	0	0	1	1	0	0
22	Beech	0.61	1	2	0	0	1	0
23.1	Beech	3.06	2	2	1	0	2	2
23.2	Beech	0.22	1	1	0	0	0	0
24	Beech	1.11	2	3	1	1	1	1
25	Oak	0.97	1	2	2	2	2	2
26	Beech	0.02	0	0	0	0	0	0
27	Beech	0.04	0	0	0	0	0	0
28	Beech	0.04	0	0	0	0	1	0
29	Beech	0.03	0	1	0	0	0	0
30	Beech	0.02	0	0	0	0	0	0
31	Beech	2.2	2	2	1	1	1	1
32	Beech	0.03	0	0	0	0	0	0
33	Beech	1.5	2	3	1	1	1	1
34.1	Whitebeam	0.7	1	1	1	1	0	2
34.2	Whitebeam	0.13	1	0	0	0	0	0
34.3	Whitebeam	0.13	0	1	0	0	0	0
35	Whitebeam	0.5	dead	dead	dead	dead	dead	dead
36	Silver birch	0.25	2	2	1	1	0	1
37	Oak	0.12	1	0	0	0	0	0
38	Beech	2.08	2	2	0	0	1	0
39	Beech	1.06	2	2	1	1	1	2
40	Beech	1.16	3	3	1	1	1	1
41	Oak	1.04	1	3	1	2	1	2
42	Silver birch	0.05	1	1	0	0	0	0
43	Beech	0.53	2	4	2	1	2	3
44	Oak	0.95	2	2	3	2	2	3
45	Beech	0.03	0	0	0	0	0	0
46	Beech	0.03	0	0	0	0	0	0
47	Beech	0.02	0	0	0	0	1	0

Tree No.	Species	Girth /m	30/08/95	06/09/95	13/09/95	20/09/95	27/09/95	11/10/95
1	Beech	1.65	1	0	0	0	0	0
2.1	Beech	1.11	0	0	0	0	1	0
2.2	Beech	1.09	0	0	0	0	0	1
3	Oak	1.03	3	2	2	3	3	3
4	Oak	0.85	2	1	0	1	1	1
5	Beech	0.8	1	0	0	0	1	1
6.1	Oak	0.93	3	2	1	3	2	3
6.2	Oak	0.97	2	2	0	2	1	3
7.1	Silver birch	0.19	0	0	0	0	0	0
7.2	Silver birch	0.09	dead	dead	dead	dead	dead	dead
8	Oak	0.44	0	0	0	0	0	1
9	Beech	0.04	0	0	0	0	0	0
10	Beech	1.87	0	0	0	1	0	0
11.1	Oak	0.54	1	1	0	1	1	1
11.2	Oak	0.92	1	1	0	2	1	1
12	Oak	1.24	3	2	2	2	2	2
13	Beech	1.6	1	1	0	2	0	0
14	Beech	1.72	0	1	0	3	1	0
15	Oak	1.21	2	2	0	1	3	2
16	Silver birch	0.12	0	0	0	0	0	0
17	Beech	1.02	0	0	0	1	0	0
18	Oak	0.36	0	0	0	0	1	0
19	Silver birch	0.24	0	0	0	0	0	1
20	Oak	1.58	3	2	1	3	3	3
21	Whitebeam	0.15	0	0	0	0	0	0
22	Beech	0.61	0	0	0	1	0	0
23.1	Beech	3.06	1	1	0	2	1	2
23.2	Beech	0.22	0	0	0	0	0	0
24	Beech	1.11	1	0	0	1	1	1
25	Oak	0.97	2	3	1	2	0	1
26	Beech	0.02	0	0	0	0	0	0
27	Beech	0.04	0	0	0	0	0	0
28	Beech	0.04	0	0	0	0	0	0
29	Beech	0.03	0	0	0	0	0	0
30	Beech	0.02	0	0	0	0	0	0
31	Beech	2.2	1	1	0	1	0	0
32	Beech	0.03	0	0	0	0	0	0
33	Beech	1.5	0	1	0	1	1	1
34.1	Whitebeam	0.7	0	1	0	1	1	1
34.2	Whitebeam	0.13	0	0	0	0	1	0
34.3	Whitebeam	0.13	0	0	0	0	0	0
35	Whitebeam	0.5	dead	dead	dead	dead	dead	dead
36	Silver birch	0.25	1	1	0	0	1	1
37	Oak	0.12	0	0	0	0	0	0
38	Beech	2.08	0	0	0	1	0	1
39	Beech	1.06	2	2	1	2	2	2
40	Beech	1.16	1	0	1	1	1	1
41	Oak	1.04	3	3	3	3	3	3
42	Silver birch	0.05	0	1	0	0	1	0
43	Beech	0.53	3	3	3	3	3	3
44	Oak	0.95	3	3	2	2	1	2
45	Beech	0.03	0	0	0	0	0	0
46	Beech	0.03	0	0	0	0	0	0
47	Beech	0.02	0	0	0	0	0	0

Tree No.	Species	Girth /m	18/10/95	25/10/95	01/11/95	08/11/95	15/11/95	22/11/95	29/11/95
1	Beech	1.65	0	0	0	0	0	1	0
2.1	Beech	1.11	0	0	0	0	0	0	0
2.2	Beech	1.09	0	1	0	0	0	0	0
3	Oak	1.03	3	3	3	1	0	0	0
4	Oak	0.85	1	1	0	0	0	0	0
5	Beech	0.8	1	1	0	1	0	0	0
6.1	Oak	0.93	3	3	3	2	1	1	0
6.2	Oak	0.97	3	3	3	2	0	0	0
7.1	Silver birch	0.19	0	0	0	1	0	0	0
7.2	Silver birch	0.09	dead	dead	dead	dead	dead	dead	dead
8	Oak	0.44	1	0	0	0	0	0	0
9	Beech	0.04	0	0	0	0	0	0	0
10	Beech	1.87	1	1	1	0	0	0	0
11.1	Oak	0.54	1	1	1	0	0	0	0
11.2	Oak	0.92	1	1	1	1	0	0	0
12	Oak	1.24	1	1	0	1	0	0	0
13	Beech	1.6	2	1	0	1	0	0	0
14	Beech	1.72	2	2	1	1	1	1	0
15	Oak	1.21	2	2	0	0	1	0	0
16	Silver birch	0.12	0	0	0	0	0	0	0
17	Beech	1.02	0	1	0	0	0	0	0
18	Oak	0.36	1	0	0	0	0	0	0
19	Silver birch	0.24	0	0	0	0	0	0	0
20	Oak	1.58	3	3	1	1	0	0	1
21	Whitebeam	0.15	0	1	0	1	0	0	0
22	Beech	0.61	0	0	0	0	0	0	1
23.1	Beech	3.06	1	1	0	1	0	1	0
23.2	Beech	0.22	0	1	0	0	0	0	0
24	Beech	1.11	1	1	0	1	0	0	0
25	Oak	0.97	1	1	1	0	0	0	0
26	Beech	0.02	0	0	0	0	0	0	0
27	Beech	0.04	0	0	0	0	0	0	0
28	Beech	0.04	0	0	0	0	0	0	0
29	Beech	0.03	0	0	0	0	0	0	0
30	Beech	0.02	0	0	0	0	0	0	0
31	Beech	2.2	0	0	1	0	0	0	0
32	Beech	0.03	0	0	0	0	0	0	0
33	Beech	1.5	1	0	0	1	0	1	1
34.1	Whitebeam	0.7	1	0	0	0	0	0	0
34.2	Whitebeam	0.13	0	0	0	0	0	0	0
34.3	Whitebeam	0.13	0	0	0	0	0	0	0
35	Whitebeam	0.5	dead	dead	dead	dead	dead	dead	dead
36	Silver birch	0.25	0	1	0	0	0	0	0
37	Oak	0.12	0	0	0	0	0	0	0
38	Beech	2.08	0	1	1	0	0	0	0
39	Beech	1.06	2	2	1	0	0	1	1
40	Beech	1.16	1	0	1	0	0	1	1
41	Oak	1.04	1	2	2	1	0	1	0
42	Silver birch	0.05	1	1	0	0	0	1	1
43	Beech	0.53	3	2	3	2	2	1	1
44	Oak	0.95	0	1	0	1	0	0	0
45	Beech	0.03	0	0	0	0	0	0	0
46	Beech	0.03	0	0	0	0	0	0	0
47	Beech	0.02	0	0	0	0	0	0	0

Dimsdale grid 2 trees 1 to 47 (1996)

Tree No.	Species	Girth /m	10/01/96	17/01/96	31/01/96	14/02/96	28/02/96	13/03/96
1	Beech	1.65	0	0	0	0	0	0
2.1	Beech	1.11	0	0	0	0	0	0
2.2	Beech	1.09	0	0	0	0	0	0
3	Oak	1.03	0	0	0	0	0	0
4	Oak	0.85	0	0	0	0	0	0
5	Beech	0.8	0	0	0	0	0	0
6.1	Oak	0.93	0	0	0	0	0	0
6.2	Oak	0.97	0	0	0	0	0	0
7.1	Silver birch	0.19	0	0	0	0	0	0
7.2	Silver birch	0.09	dead	dead	dead	dead	dead	dead
8	Oak	0.44	0	0	0	0	0	0
9	Beech	0.04	0	0	0	0	0	0
10	Beech	1.87	0	0	0	0	0	0
11.1	Oak	0.54	0	0	0	0	0	0
11.2	Oak	0.92	0	0	0	0	0	0
12	Oak	1.24	0	0	0	0	0	0
13	Beech	1.6	0	0	0	0	0	0
14	Beech	1.72	0	0	0	0	0	0
15	Oak	1.21	0	0	0	0	0	0
16	Silver birch	0.12	0	0	0	0	0	0
17	Beech	1.02	0	0	0	0	0	0
18	Oak	0.36	0	0	0	0	0	0
19	Silver birch	0.24	0	0	0	0	0	0
20	Oak	1.58	0	0	0	0	0	0
21	Whitebeam	0.15	0	0	0	0	0	0
22	Beech	0.61	0	0	0	0	0	0
23.1	Beech	3.06	0	0	0	0	0	0
23.2	Beech	0.22	0	0	0	0	0	0
24	Beech	1.11	0	0	0	0	0	0
25	Oak	0.97	0	0	0	0	0	0
26	Beech	0.02	0	0	0	0	0	0
27	Beech	0.04	0	0	0	0	0	0
28	Beech	0.04	0	0	0	0	0	0
29	Beech	0.03	0	0	0	0	0	0
30	Beech	0.02	0	0	0	0	0	0
31	Beech	2.2	0	0	0	0	0	0
32	Beech	0.03	0	0	0	0	0	0
33	Beech	1.5	0	0	0	0	0	0
34.1	Whitebeam	0.7	0	0	0	0	0	0
34.2	Whitebeam	0.13	0	0	0	0	0	0
34.3	Whitebeam	0.13	0	0	0	0	0	0
35	Whitebeam	0.5	dead	dead	dead	dead	dead	dead
36	Silver birch	0.25	0	0	0	0	0	0
37	Oak	0.12	0	0	0	0	0	0
38	Beech	2.08	0	0	0	0	0	0
39	Beech	1.06	0	0	0	0	0	0
40	Beech	1.16	0	0	0	0	0	0
41	Oak	1.04	0	0	0	0	0	0
42	Silver birch	0.05	0	0	0	0	0	0
43	Beech	0.53	0	0	0	0	0	0
44	Oak	0.95	0	0	0	0	0	0
45	Beech	0.03	0	0	0	0	0	0
46	Beech	0.03	0	0	0	0	0	0
47	Beech	0.02	0	0	0	0	0	0

Tree No.	Species	Girth /m	27/03/96	03/04/96	17/04/96	01/05/96	15/05/96	22/05/96
1	Beech	1.65	0	1	1	0	1	0
2.1	Beech	1.11	0	1	1	0	1	0
2.2	Beech	1.09	0	0	1	0	1	0
3	Oak	1.03	0	1	1	1	4	3
4	Oak	0.85	0	0	1	1	3	2
5	Beech	0.8	0	0	0	1	1	1
6.1	Oak	0.93	0	0	1	3	3	3
6.2	Oak	0.97	0	0	0	3	3	3
7.1	Silver birch	0.19	0	1	1	1	0	0
7.2	Silver birch	0.09	dead	dead	dead	dead	dead	dead
8	Oak	0.44	0	0	1	0	1	1
9	Beech	0.04	0	0	0	0	0	0
10	Beech	1.87	0	0	1	0	1	1
11.1	Oak	0.54	0	0	1	1	2	2
11.2	Oak	0.92	0	0	1	2	3	1
12	Oak	1.24	0	1	2	2	3	3
13	Beech	1.6	0	1	1	1	1	0
14	Beech	1.72	0	0	1	1	1	0
15	Oak	1.21	0	0	1	1	3	2
16	Silver birch	0.12	0	0	1	0	0	0
17	Beech	1.02	0	1	1	0	1	1
18	Oak	0.36	0	0	0	0	2	1
19	Silver birch	0.24	0	1	1	0	0	1
20	Oak	1.58	0	0	1	3	3	3
21	Whitebeam	0.15	0	1	1	0	1	1
22	Beech	0.61	0	1	1	0	1	1
23.1	Beech	3.06	0	1	1	0	1	0
23.2	Beech	0.22	0	0	1	0	1	0
24	Beech	1.11	0	2	1	1	0	0
25	Oak	0.97	0	0	0	0	2	1
26	Beech	0.02	0	0	0	0	0	0
27	Beech	0.04	0	0	0	0	0	0
28	Beech	0.04	0	0	0	0	0	0
29	Beech	0.03	0	0	0	0	0	0
30	Beech	0.02	0	0	0	0	0	0
31	Beech	2.2	0	0	1	1	1	0
32	Beech	0.03	0	0	0	0	1	0
33	Beech	1.5	0	2	1	1	1	1
34.1	Whitebeam	0.7	0	0	1	0	1	0
34.2	Whitebeam	0.13	0	0	1	0	0	1
34.3	Whitebeam	0.13	0	1	1	0	1	0
35	Whitebeam	0.5	dead	dead	dead	dead	dead	dead
36	Silver birch	0.25	0	1	0	0	1	0
37	Oak	0.12	0	0	0	1	1	0
38	Beech	2.08	0	1	1	0	1	0
39	Beech	1.06	0	1	0	0	1	1
40	Beech	1.16	0	2	1	1	1	1
41	Oak	1.04	0	2	1	1	2	1
42	Silver birch	0.05	0	2	1	1	1	1
43	Beech	0.53	0	2	2	1	1	1
44	Oak	0.95	0	1	1	2	3	3
45	Beech	0.03	0	0	0	0	0	0
46	Beech	0.03	0	0	0	0	0	0
47	Beech	0.02	0	0	0	0	0	0

Tree No.	Species	Girth /m	02/06/96	24/06/96	26/06/96
1	Beech	1.65	1	1	1
2.1	Beech	1.11	0	1	1
2.2	Beech	1.09	0	0	1
3	Oak	1.03	4	3	3
4	Oak	0.85	3	3	1
5	Beech	0.8	0	0	1
6.1	Oak	0.93	3	3	3
6.2	Oak	0.97	3	3	3
7.1	Silver birch	0.19	0	1	1
7.2	Silver birch	0.09	dead	dead	dead
8	Oak	0.44	0	1	1
9	Beech	0.04	0	1	0
10	Beech	1.87	1	1	1
11.1	Oak	0.54	2	2	1
11.2	Oak	0.92	3	1	1
12	Oak	1.24	3	3	3
13	Beech	1.6	1	1	2
14	Beech	1.72	0	3	1
15	Oak	1.21	2	3	3
16	Silver birch	0.12	0	0	1
17	Beech	1.02	1	1	1
18	Oak	0.36	1	0	1
19	Silver birch	0.24	1	0	1
20	Oak	1.58	4	3	3
21	Whitebeam	0.15	0	0	1
22	Beech	0.61	1	0	0
23.1	Beech	3.06	1	2	1
23.2	Beech	0.22	0	0	0
24	Beech	1.11	1	2	2
25	Oak	0.97	2	2	1
26	Beech	0.02	0	0	0
27	Beech	0.04	0	0	0
28	Beech	0.04	0	0	0
29	Beech	0.03	0	0	0
30	Beech	0.02	0	0	0
31	Beech	2.2	0	1	1
32	Beech	0.03	0	0	0
33	Beech	1.5	0	1	1
34.1	Whitebeam	0.7	1	1	1
34.2	Whitebeam	0.13	0	0	1
34.3	Whitebeam	0.13	0	0	1
35	Whitebeam	0.5	dead	dead	dead
36	Silver birch	0.25	0	1	1
37	Oak	0.12	1	0	1
38	Beech	2.08	0	1	1
39	Beech	1.06	0	2	1
40	Beech	1.16	1	1	1
41	Oak	1.04	2	3	2
42	Silver birch	0.05	1	1	1
43	Beech	0.53	1	3	2
44	Oak	0.95	3	3	3
45	Beech	0.03	0	0	0
46	Beech	0.03	0	0	0
47	Beech	0.02	0	0	0

Dimsdale grid 2, trees 48 to 83 (1994)

Tree No.	Species	Girth /m	23/05/94	02/06/94	16/06/94	30/06/94	14/07/94	28/07/94	12/08/94
48	Beech	0.02	0	0	0	1	0	0	0
49	Beech	0.06	1	1	1	0	0	0	0
50	Beech	0.04	0	0	0	1	0	0	0
51	Oak	1.03	3	3	3	3	3	2	2
52	Oak	0.99	2	3	3	2	3	1	2
53	Beech	0.04	0	0	1	0	1	0	0
54	Beech	0.06	0	0	0	0	0	0	0
55	Beech	0.09	0	0	0	0	1	0	0
56	Beech	0.05	0	0	1	0	1	0	0
57	Beech	0.03	0	0	0	1	0	0	0
58	Beech	0.05	0	1	1	1	0	0	0
59	Whitebeam	0.04	0	0	0	0	0	0	0
60	Oak	1.39	5	4	5	5	4	3	3
61	Whitebeam	0.04	/	0	1	0	0	0	0
62	Beech	2.75	1	1	1	2	2	0	2
63	Whitebeam	0.07	0	0	0	1	0	0	0
64	Silver birch	0.07	0	0	0	1	0	0	0
65	Whitebeam	0.09	0	0	0	1	0	0	0
66	Whitebeam	0.09	0	0	0	1	1	0	0
67	Whitebeam	0.09	1	0	1	1	1	0	0
68	Oak	1.2	3	5	4	4	4	3	3
69	Beech	3.51	1	1	3	4	4	4	4
70	Oak	1.29	/	5	5	4	4	4	4
71	Oak	1.01	3	3	2	3	4	3	3
72	Oak	1.09	3	3	3	3	4	3	3
73	Beech	0.08	0	1	0	1	1	0	0
74	Oak	1.45	3	3	3	4	5	4	3
75	Oak	0.98	2	3	3	3	3	2	2
76	Beech	0.07	0	1	1	1	1	0	0
77	Oak	0.86	3	3	3	3	4	3	3
78	Oak	0.68	1	2	2	2	1	1	2
79.1	Oak	0.79	2	1	1	3	3	1	2
79.2	Oak	0.49	2	1	2	2	2	1	2
80	Beech	3.81	1	1	1	1	3	0	0
81.1	Oak	0.95	3	4	3	4	4	3	3
81.2	Oak	1.17	4	4	3	4	4	3	3
82	Oak	1.08	4	5	5	3	4	3	3
83	Beech	0.15	/	1	1	1	0	0	0

Tree No.	Species	Girth /m	02/09/94	16/09/94	27/10/94	10/11/94	23/11/94	09/12/94
48	Beech	0.02	0	0	0	0	0	0
49	Beech	0.06	0	0	0	0	0	0
50	Beech	0.04	0	0	0	0	0	0
51	Oak	1.03	1	2	0	0	0	0
52	Oak	0.99	1	2	1	0	0	0
53	Beech	0.04	0	0	0	0	0	0
54	Beech	0.06	0	0	0	0	0	0
55	Beech	0.09	0	0	0	0	0	0
56	Beech	0.05	0	0	0	0	0	0
57	Beech	0.03	0	0	0	0	0	0
58	Beech	0.05	0	0	0	0	0	0
59	Whitebeam	0.04	0	0	0	0	0	0
60	Oak	1.39	3	3	1	0	0	0
61	Whitebeam	0.04	0	0	0	0	0	0
62	Beech	2.75	0	0	0	1	1	0
63	Whitebeam	0.07	0	0	0	0	0	0
64	Silver birch	0.07	0	0	0	0	0	0
65	Whitebeam	0.09	0	0	0	0	0	0
66	Whitebeam	0.09	0	0	0	0	0	0
67	Whitebeam	0.09	0	0	0	0	0	0
68	Oak	1.2	3	3	0	1	1	0
69	Beech	3.51	4	3	1	1	1	0
70	Oak	1.29	4	3	3	1	2	0
71	Oak	1.01	3	3	1	1	0	0
72	Oak	1.09	3	3	0	1	0	0
73	Beech	0.08	0	0	0	1	0	0
74	Oak	1.45	4	3	1	1	1	0
75	Oak	0.98	1	1	0	0	0	0
76	Beech	0.07	0	0	0	0	0	0
77	Oak	0.86	3	2	1	0	0	0
78	Oak	0.68	1	1	1	0	0	0
79.1	Oak	0.79	1	1	0	0	0	0
79.2	Oak	0.49	1	1	0	0	1	0
80	Beech	3.81	3	0	1	1	1	0
81.1	Oak	0.95	3	3	3	1	0	0
81.2	Oak	1.17	3	3	3	1	1	1
82	Oak	1.08	3	3	1	0	0	0
83	Beech	0.15	0	0	0	1	0	0

Dimsdale grid 2, trees 48 to 83 (1995)

Tree No.	Species	Girth /m	04/01/95	08/02/95	08/03/95	22/03/95	07/04/95	12/04/95
48	Beech	0.02	0	0	0	0	0	0
49	Beech	0.06	0	0	0	0	0	0
50	Beech	0.04	0	0	0	0	0	0
51	Oak	1.03	0	0	0	1	2	2
52	Oak	0.99	0	0	0	1	2	1
53	Beech	0.04	0	0	0	0	0	0
54	Beech	0.06	0	0	0	0	0	0
55	Beech	0.09	0	0	0	0	0	0
56	Beech	0.05	0	0	0	0	0	0
57	Beech	0.03	0	0	0	0	0	0
58	Beech	0.05	0	0	0	0	0	0
59	Whitebeam	0.04	0	0	0	0	0	0
60	Oak	1.39	0	0	0	2	3	3
61	Whitebeam	0.04	0	0	0	0	0	1
62	Beech	2.75	0	0	0	2	1	1
63	Whitebeam	0.07	0	0	0	0	1	0
64	Silver birch	0.07	0	0	0	0	0	0
65	Whitebeam	0.09	0	0	0	0	0	0
66	Whitebeam	0.09	0	0	0	0	0	0
67	Whitebeam	0.09	0	0	0	0	1	3
68	Oak	1.2	0	0	0	2	3	1
69	Beech	3.51	0	0	1	4	1	4
70	Oak	1.29	0	0	0	4	4	3
71	Oak	1.01	0	0	0	3	2	2
72	Oak	1.09	0	0	0	2	3	0
73	Beech	0.08	0	0	0	1	0	3
74	Oak	1.45	0	0	0	1	3	2
75	Oak	0.98	0	0	0	1	2	0
76	Beech	0.07	0	0	0	0	0	3
77	Oak	0.86	0	0	0	2	3	3
78	Oak	0.68	0	0	0	3	2	2
79.1	Oak	0.79	0	0	0	2	2	2
79.2	Oak	0.49	0	0	0	2	2	2
80	Beech	3.81	0	0	0	3	2	4
81.1	Oak	0.95	0	0	0	3	3	4
81.2	Oak	1.17	0	0	0	3	3	3
82	Oak	1.08	0	0	0	2	3	3
83	Beech	0.15	0	0	0	1	1	0

Tree No.	Species	Girth /m	20/04/95	04/05/95	11/05/95	18/05/95	24/05/95	31/05/95
48	Beech	0.02	0	0	0	0	0	1
49	Beech	0.06	0	0	0	0	0	0
50	Beech	0.04	0	0	0	0	0	0
51	Oak	1.03	3	2	1	2	3	3
52	Oak	0.99	2	1	1	2	3	2
53	Beech	0.04	0	0	0	0	0	0
54	Beech	0.06	0	0	0	0	1	0
55	Beech	0.09	0	0	1	0	1	0
56	Beech	0.05	0	0	0	0	1	0
57	Beech	0.03	0	0	0	1	0	0
58	Beech	0.05	0	0	0	0	0	0
59	Whitebeam	0.04	0	0	0	1	0	1
60	Oak	1.39	3	3	3	4	3	3
61	Whitebeam	0.04	0	0	0	0	0	0
62	Beech	2.75	0	1	0	0	0	1
63	Whitebeam	0.07	0	0	0	0	0	1
64	Silver birch	0.07	0	0	0	0	0	1
65	Whitebeam	0.09	0	0	0	0	0	0
66	Whitebeam	0.09	0	0	0	0	0	0
67	Whitebeam	0.09	0	0	0	0	1	1
68	Oak	1.2	3	3	3	3	3	3
69	Beech	3.51	2	1	1	1	2	3
70	Oak	1.29	4	3	3	4	3	3
71	Oak	1.01	3	2	3	3	3	3
72	Oak	1.09	2	2	1	3	2	1
73	Beech	0.08	0	0	0	0	0	1
74	Oak	1.45	2	2	2	3	3	3
75	Oak	0.98	1	1	1	1	3	3
76	Beech	0.07	0	0	0	0	0	1
77	Oak	0.86	3	3	3	3	3	3
78	Oak	0.68	3	1	1	3	2	3
79.1	Oak	0.79	2	2	1	3	2	3
79.2	Oak	0.49	2	2	1	3	2	3
80	Beech	3.81	1	1	0	1	1	1
81.1	Oak	0.95	3	3	2	3	2	3
81.2	Oak	1.17	3	3	3	3	3	3
82	Oak	1.08	3	3	3	3	3	3
83	Beech	0.15	0	0	0	0	1	1

Tree No.	Species	Girth /m	08/06/95	13/06/95	21/06/95	28/06/95	05/97/95	12/07/95
48	Beech	0.02	0	0	0	0	0	0
49	Beech	0.06	0	0	0	0	0	0
50	Beech	0.04	0	0	0	0	0	0
51	Oak	1.03	3	2	2	2	2	1
52	Oak	0.99	3	1	2	2	1	1
53	Beech	0.04	1	1	/	0	0	1
54	Beech	0.06	1	0	/	0	0	0
55	Beech	0.09	1	1	/	0	0	1
56	Beech	0.05	1	0	/	0	0	0
57	Beech	0.03	0	0	/	0	0	0
58	Beech	0.05	1	0	/	0	0	0
59	Whitebeam	0.04	0	0	/	0	0	0
60	Oak	1.39	3	3	3	3	2	2
61	Whitebeam	0.04	0	0	/	0	0	0
62	Beech	2.75	0	1	1	1	1	1
63	Whitebeam	0.07	0	0	0	0	1	0
64	Silver birch	0.07	1	0	0	0	0	1
65	Whitebeam	0.09	1	0	0	1	0	0
66	Whitebeam	0.09	0	0	0	0	0	0
67	Whitebeam	0.09	1	1	0	0	0	0
68	Oak	1.2	3	2	2	2	1	1
69	Beech	3.51	3	1	2	3	3	3
70	Oak	1.29	3	3	/	2	3	2
71	Oak	1.01	3	2	2	1	1	1
72	Oak	1.09	2	0	1	1	1	1
73	Beech	0.08	1	0	0	0	1	0
74	Oak	1.45	2	1	1	1	1	1
75	Oak	0.98	2	1	2	1	1	1
76	Beech	0.07	1	0	0	1	1	1
77	Oak	0.86	3	2	1	1	1	1
78	Oak	0.68	3	2	1	1	1	1
79.1	Oak	0.79	2	2	2	1	1	1
79.2	Oak	0.49	2	2	1	1	1	1
80	Beech	3.81	0	1	1	1	1	1
81.1	Oak	0.95	3	2	2	2	2	1
81.2	Oak	1.17	3	3	2	2	2	2
82	Oak	1.08	3	2	2	2	1	2
83	Beech	0.15	0	1	0	0	1	1

Tree No.	Species	Girth /m	19/07/95	26/07/95	03/08/95	09/08/95	16/08/95	23/08/95
48	Beech	0.02	1	0	0	0	0	0
49	Beech	0.06	0	0	1	0	0	0
50	Beech	0.04	0	0	0	0	0	0
51	Oak	1.03	2	2	1	2	2	2
52	Oak	0.99	1	1	1	1	1	1
53	Beech	0.04	0	1	0	0	0	0
54	Beech	0.06	1	0	0	0	0	0
55	Beech	0.09	1	1	0	0	0	0
56	Beech	0.05	0	0	0	0	0	0
57	Beech	0.03	1	0	0	0	0	0
58	Beech	0.05	1	0	0	0	0	0
59	Whitebeam	0.04	0	0	0	0	0	0
60	Oak	1.39	1	3	1	1	2	2
61	Whitebeam	0.04	0	0	0	0	0	0
62	Beech	2.75	3	2	0	1	0	0
63	Whitebeam	0.07	0	0	0	0	0	0
64	Silver birch	0.07	0	0	0	0	1	0
65	Whitebeam	0.09	0	0	0	0	0	0
66	Whitebeam	0.09	0	0	0	0	0	0
67	Whitebeam	0.09	1	0	0	0	0	0
68	Oak	1.2	1	2	1	1	2	1
69	Beech	3.51	4	4	1	1	1	1
70	Oak	1.29	1	3	3	3	3	3
71	Oak	1.01	2	2	2	2	2	2
72	Oak	1.09	1	1	1	1	1	2
73	Beech	0.08	0	1	0	0	0	0
74	Oak	1.45	1	2	3	1	3	1
75	Oak	0.98	1	1	1	2	1	1
76	Beech	0.07	1	1	0	0	0	0
77	Oak	0.86	1	1	1	1	2	2
78	Oak	0.68	1	1	1	1	0	0
79.1	Oak	0.79	1	1	1	1	1	1
79.2	Oak	0.49	1	1	1	1	1	1
80	Beech	3.81	1	3	1	1	0	0
81.1	Oak	0.95	1	3	0	1	2	2
81.2	Oak	1.17	1	3	1	1	2	2
82	Oak	1.08	1	2	0	1	2	1
83	Beech	0.15	1	1	0	1	0	0

Tree No.	Species	Girth /m	30/08/95	06/09/95	13/09/95	20/09/95	27/09/95	11/10/95
48	Beech	0.02	0	0	0	0	0	0
49	Beech	0.06	0	0	0	0	0	0
50	Beech	0.04	0	0	0	0	0	0
51	Oak	1.03	2	1	2	2	2	3
52	Oak	0.99	1	1	1	1	1	2
53	Beech	0.04	0	0	0	0	0	0
54	Beech	0.06	0	0	0	0	0	0
55	Beech	0.09	0	0	0	0	0	0
56	Beech	0.05	0	0	1	1	0	0
57	Beech	0.03	0	0	0	0	0	0
58	Beech	0.05	0	0	0	0	0	0
59	Whitebeam	0.04	0	0	0	0	0	0
60	Oak	1.39	3	2	1	2	2	2
61	Whitebeam	0.04	0	0	0	0	0	0
62	Beech	2.75	1	1	0	1	0	1
63	Whitebeam	0.07	0	0	0	0	0	0
64	Silver birch	0.07	0	0	0	0	0	0
65	Whitebeam	0.09	0	0	0	0	0	0
66	Whitebeam	0.09	0	0	0	0	0	0
67	Whitebeam	0.09	0	0	0	0	0	0
68	Oak	1.2	2	0	0	1	0	1
69	Beech	3.51	1	2	1	1	1	1
70	Oak	1.29	4	4	3	3	3	1
71	Oak	1.01	2	3	1	1	2	2
72	Oak	1.09	1	2	2	3	1	3
73	Beech	0.08	0	0	0	1	0	0
74	Oak	1.45	3	2	2	3	2	3
75	Oak	0.98	1	1	1	2	1	1
76	Beech	0.07	0	0	0	0	0	0
77	Oak	0.86	2	3	2	2	1	0
78	Oak	0.68	2	2	1	2	2	2
79.1	Oak	0.79	2	1	1	2	2	2
79.2	Oak	0.49	1	1	0	3	1	2
80	Beech	3.81	0	0	0	1	0	1
81.1	Oak	0.95	3	3	1	3	3	3
81.2	Oak	1.17	3	3	2	3	3	3
82	Oak	1.08	3	2	3	3	3	2
83	Beech	0.15	1	0	1	1	0	1

Tree No.	Species	Girth /m	18/10/95	25/10/95	01/11/95	08/11/95	15/11/95	22/11/95	29/11/95
48	Beech	0.02	0	0	0	0	0	0	0
49	Beech	0.06	0	0	0	0	0	0	0
50	Beech	0.04	0	0	0	0	0	0	0
51	Oak	1.03	2	0	1	0	0	0	0
52	Oak	0.99	0	1	0	0	1	0	0
53	Beech	0.04	0	0	0	0	0	0	0
54	Beech	0.06	0	0	0	0	0	0	0
55	Beech	0.09	0	0	0	1	0	0	0
56	Beech	0.05	0	0	0	0	0	0	0
57	Beech	0.03	0	0	0	0	0	0	0
58	Beech	0.05	0	0	0	0	0	0	0
59	Whitebeam	0.04	0	0	0	0	0	0	0
60	Oak	1.39	1	2	1	0	0	0	0
61	Whitebeam	0.04	0	0	0	0	0	0	0
62	Beech	2.75	0	1	0	0	0	0	0
63	Whitebeam	0.07	0	0	0	0	0	0	0
64	Silver birch	0.07	0	0	0	0	0	0	0
65	Whitebeam	0.09	0	0	0	0	0	0	0
66	Whitebeam	0.09	0	0	0	0	0	0	0
67	Whitebeam	0.09	0	0	0	0	0	0	0
68	Oak	1.2	0	1	1	1	0	0	0
69	Beech	3.51	1	1	1	1	0	0	0
70	Oak	1.29	3	3	2	2	0	1	0
71	Oak	1.01	2	1	1	0	0	0	0
72	Oak	1.09	2	2	2	1	0	0	0
73	Beech	0.08	0	0	0	0	0	0	0
74	Oak	1.45	2	3	2	2	0	0	0
75	Oak	0.98	1	1	2	0	0	0	0
76	Beech	0.07	0	0	0	1	0	0	0
77	Oak	0.86	1	1	1	0	0	0	0
78	Oak	0.68	1	1	0	0	0	0	0
79.1	Oak	0.79	2	3	1	0	0	0	0
79.2	Oak	0.49	2	2	1	1	0	0	0
80	Beech	3.81	1	0	0	1	0	0	0
81.1	Oak	0.95	3	2	2	2	0	0	0
81.2	Oak	1.17	3	2	2	1	0	0	0
82	Oak	1.08	2	2	0	1	0	0	0
83	Beech	0.15	0	1	0	1	0	1	0

Dimsdale grid 2, trees 48 to 83 (1996)

Tree No.	Species	Girth /m	10/01/96	17/01/96	31/01/96	14/02/96	28/02/96	13/03/96
48	Beech	0.02	0	0	0	0	0	0
49	Beech	0.06	0	0	0	0	0	0
50	Beech	0.04	0	0	0	0	0	0
51	Oak	1.03	0	0	0	0	0	0
52	Oak	0.99	0	0	0	0	0	0
53	Beech	0.04	0	0	0	0	0	0
54	Beech	0.06	0	0	0	0	0	0
55	Beech	0.09	0	0	0	0	0	0
56	Beech	0.05	0	0	0	0	0	0
57	Beech	0.03	0	0	0	0	0	0
58	Beech	0.05	0	0	0	0	0	0
59	Whitebeam	0.04	0	0	0	0	0	0
60	Oak	1.39	0	0	0	0	0	0
61	Whitebeam	0.04	0	0	0	0	0	0
62	Beech	2.75	0	0	0	0	0	0
63	Whitebeam	0.07	0	0	0	0	0	0
64	Silver birch	0.07	0	0	0	0	0	0
65	Whitebeam	0.09	0	0	0	0	0	0
66	Whitebeam	0.09	0	0	0	0	0	0
67	Whitebeam	0.09	0	0	0	0	0	0
68	Oak	1.2	0	0	0	0	0	0
69	Beech	3.51	0	0	0	0	0	0
70	Oak	1.29	0	0	0	0	0	0
71	Oak	1.01	0	0	0	0	0	0
72	Oak	1.09	0	0	0	0	0	0
73	Beech	0.08	0	0	0	0	0	0
74	Oak	1.45	0	0	0	0	0	0
75	Oak	0.98	0	0	0	0	0	0
76	Beech	0.07	0	0	0	0	0	0
77	Oak	0.86	0	0	0	0	0	0
78	Oak	0.68	0	0	0	0	0	0
79.1	Oak	0.79	0	0	0	0	0	0
79.2	Oak	0.49	0	0	0	0	0	0
80	Beech	3.81	0	0	0	0	0	0
81.1	Oak	0.95	0	0	0	0	0	0
81.2	Oak	1.17	0	0	0	0	0	0
82	Oak	1.08	0	0	0	0	0	0
83	Beech	0.15	0	0	0	0	0	0

Tree No.	Species	Girth /m	27/03/96	03/04/96	17/04/96	01/05/96	15/05/96	22/05/96
48	Beech	0.02	0	0	0	0	0	0
49	Beech	0.06	0	0	0	0	0	0
50	Beech	0.04	0	0	0	0	0	0
51	Oak	1.03	0	1	1	2	4	1
52	Oak	0.99	0	1	1	1	3	2
53	Beech	0.04	0	0	0	0	0	0
54	Beech	0.06	0	0	1	0	0	0
55	Beech	0.09	0	0	0	0	1	0
56	Beech	0.05	0	0	1	0	0	0
57	Beech	0.03	0	0	0	0	0	0
58	Beech	0.05	0	1	0	0	0	0
59	Whitebeam	0.04	0	0	0	0	0	0
60	Oak	1.39	0	1	0	3	2	3
61	Whitebeam	0.04	0	0	0	0	0	0
62	Beech	2.75	0	1	0	0	0	1
63	Whitebeam	0.07	0	0	0	0	0	0
64	Silver birch	0.07	0	0	0	0	0	0
65	Whitebeam	0.09	0	0	0	0	0	0
66	Whitebeam	0.09	0	0	0	0	0	0
67	Whitebeam	0.09	0	0	0	0	0	0
68	Oak	1.2	0	1	1	1	2	2
69	Beech	3.51	0	2	1	0	1	1
70	Oak	1.29	0	4	1	3	5	4
71	Oak	1.01	0	1	1	1	5	2
72	Oak	1.09	0	1	0	1	3	1
73	Beech	0.08	0	0	1	0	0	0
74	Oak	1.45	0	0	0	0	2	1
75	Oak	0.98	0	0	0	0	2	0
76	Beech	0.07	0	0	1	0	1	0
77	Oak	0.86	0	0	1	1	5	4
78	Oak	0.68	0	2	2	1	4	3
79.1	Oak	0.79	0	2	1	3	4	3
79.2	Oak	0.49	0	2	1	3	4	3
80	Beech	3.81	0	1	1	0	0	0
81.1	Oak	0.95	0	2	1	3	3	3
81.2	Oak	1.17	0	2	1	3	3	3
82	Oak	1.08	0	2	1	2	2	3
83	Beech	0.15	0	0	1	0	0	0

Tree No.	Species	Girth /m	02/06/96	24/06/96	26/06/96
48	Beech	0.02	0	0	0
49	Beech	0.06	0	0	0
50	Beech	0.04	0	0	0
51	Oak	1.03	3	3	3
52	Oak	0.99	3	2	3
53	Beech	0.04	0	0	0
54	Beech	0.06	0	0	0
55	Beech	0.09	1	0	0
56	Beech	0.05	0	1	0
57	Beech	0.03	0	0	0
58	Beech	0.05	0	0	0
59	Whitebeam	0.04	0	1	0
60	Oak	1.39	3	3	3
61	Whitebeam	0.04	0	0	1
62	Beech	2.75	1	0	1
63	Whitebeam	0.07	0	0	0
64	Silver birch	0.07	0	0	0
65	Whitebeam	0.09	0	0	0
66	Whitebeam	0.09	0	0	0
67	Whitebeam	0.09	1	0	0
68	Oak	1.2	3	3	3
69	Beech	3.51	1	0	2
70	Oak	1.29	4	5	4
71	Oak	1.01	3	3	2
72	Oak	1.09	2	2	1
73	Beech	0.08	0	0	0
74	Oak	1.45	3	3	3
75	Oak	0.98	2	3	2
76	Beech	0.07	0	0	0
77	Oak	0.86	4	3	3
78	Oak	0.68	4	3	1
79.1	Oak	0.79	3	3	2
79.2	Oak	0.49	3	3	2
80	Beech	3.81	1	1	1
81.1	Oak	0.95	3	4	3
81.2	Oak	1.17	3	4	3
82	Oak	1.08	3	4	3
83	Beech	0.15	0	1	1

Appendix C: Quadrat counts for Dimsdale grids 1 and 2

Dimsdale grid 1

23/08/95	7	8	9	7	8	10	80
	60	13	4	12	28	6	4
	12	12	5	9	6	3	5
	14	8	35	500+(nest)	7	23	11
	6	7	17	15	4	5	5
	19	5	10	11	3	4	4
	11	5	24	2	3	2	5
20/09/95	5	9	6	11	7	5	3
	39	13	2	3	7	6	5
	11	12	6	3	4	2	1
	4	3	35	150+(nest)	2	4	4
	2	5	17	30	11	8	2
	45	3	6	12	7	4	2
	5	7	6	12	5	0	2
22/11/95	0	0	2	1	0	0	0
	10	4	2	1	1	1	0
	1	2	0	0	1	0	0
	1	1	0	30 (nest)	0	1	0
	1	1	1	1	0	0	1
	1	0	0	0	1	1	0
	1	0	0	0	1	1	0
	0	0	0	0	0	1	0
17/01/96	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	1	0	0	0	0	0	0
	0	0	0	0 (nest)	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
27/03/96	0	0	0	0	0	0	0
	2	0	0	1	0	0	0
	0	0	0	0	0	0	0
	0	0	0	50 (nest)	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
15/05/96	3	8	10	4	4	8	2
	10	5	11	4	12	7	15
	35	70	80	30	8	20	25
	15	30	8	300 (nest)	8	100	3
	6	10	15	30	4	12	25
	6	14	2	30	4	6	15
	13	18	3	15	3	5	6
26/06/96	38	8	21	15	16	9	12
	29	35	5	4	13	18	36
	80	11	15	16	6	8	120
	30	20	60	300 (nest)	5	17	26
	9	6	19	13	40	4	11
	20	9	4	6	140	9	5
	9	6	7	6	15	30	13

Dimsdale grid 2

23/08/95	8	2	0	7	3	1	0
	14	2	2	6	1	15	0
	4	40	3	16	6	3	1
	7	4	8	200+ (nest)	32	4	3
	11	1	11	40	15	18	0
	5	1	14	25	1	13	6
	1	4	3	0	6	1	3
20/09/95	6	0	8	5	0	3	2
	17	1	2	3	5	14	1
	5	60	1	12	19	5	18
	2	4	7	100+ (nest)	14	10	4
	4	5	15	30	2	45	12
	3	3	10	18	4	8	35
	4	20	0	6	3	6	8
22/11/95	0	0	0	1	0	0	0
	0	0	0	0	0	0	0
	1	1	0	0	0	2	0
	0	1	1	10 (nest)	1	0	0
	0	0	1	2	1	0	0
	3	0	0	2	1	1	0
	0	0	1	0	0	0	0
17/01/96	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	4 (nest)	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
27/03/96	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	1	0	0	0	0	0
	1	1	6	40	0	0	0
	0	2	13	80 (nest)	4	0	0
	0	0	0	0	0	0	0
	0	1	0	0	0	0	0
15/05/96	15	15	13	10	7	1	30
	100	11	3	9	40	15	7
	25	8	12	4	15	7	1
	8	9	60	1000 (nest)	30	4	13
	6	15	40	70	4	4	1
	11	30	5	25	5	6	3
	6	2	2	15	3	7	4
26/06/96	21	11	3	8	3	3	5
	38	6	5	6	5	10	100
	27	70	26	24	40	60	50
	20	8	25	400 (nest)	14	7	9
	8	15	5	45	50	17	9
	10	13	13	10	7	30	14
	17	30	3	14	6	3	7

Appendix D: Foraging counts for Halse grids 1 and 2 for 1994 to 1996

Halse grid 1, trees 1 to 40 (1994)

Tree No.	Species	Girth /m	23/05/94	02/06/94	16/06/94	30/06/94	14/07/94	28/07/94	12/08/94
1.1	Beech	1.18	1	1	0	1	1	0	0
1.2	Beech	1.07	0	0	1	1	1	1	1
1.3	Beech	0.72	1	1	0	0	0	0	1
2	Beech	0.04	0	0	0	0	0	0	0
3	?Goats willow	0.09	/	/	0	0	0	0	0
4	Silver birch	0.05	/	/	0	1	0	0	0
5.1	?Goats willow	0.31	1	2	1	1	1	1	2
5.2	?Goats willow	0.18	1	1	1	0	0	1	1
6	Oak	1.74	3	3	3	2	3	3	3
7	?Goats willow	0.2	1	1	2	1	1	0	0
8	Silver birch	0.06	/	0	1	0	0	0	0
9	Beech	0.89	0	1	1	1	1	1	0
10	Beech	1.56	/	1	2	1	1	1	0
11	Oak	1.69	3	3	3	4	4	3	3
12	Silver birch	0.2	1	2	2	1	2	1	0
13.1	Beech	1.72	1	1	1	3	3	1	2
13.2	Beech	0.75	1	1	3	2	2	1	2
14	Beech	0.05	/	/	/	0	0	0	0
15	?Goats willow	0.25	1	1	1	1	0	0	0
16	Silver birch	0.07	1	0	0	0	0	0	0
17	Silver birch	0.06	1	0	1	0	0	0	0
18.1	?Goats willow	0.35	1	1	1	1	0	0	0
18.2	?Goats willow	0.28	1	1	1	2	0	0	0
19	Silver birch	0.06	1	1	0	0	1	0	0
20	Silver birch	0.06	1	1	1	0	1	0	0
21	Beech	1.87	2	3	2	3	3	3	3
22	Silver birch	0.54	4	4	4	3	3	1	1
23	Silver birch	0.19	3	3	3	2	2	0	1
24	Silver birch	0.19	/	2	2	2	2	0	0
25	Silver birch	0.2	/	2	2	2	2	0	0
26	Silver birch	0.08	/	2	2	1	0	0	0
27	?Goats willow	0.32	3	4	3	2	1	1	0
28	?Goats willow	0.27	3	3	2	2	1	1	1
29	Beech	0.05	/	1	1	0	1	0	0
30.1	Oak	1.01	2	3	3	3	4	3	3
30.2	Oak	0.72	1	2	3	3	1	0	1
30.3	Oak	1.04	2	2	2	1	4	3	3
31.1	Oak	1.54	5	5	4	4	5	3	3
31.2	Oak	1.46	4	5	4	4	5	3	3
32	Silver birch	1.29	1	1	1	2	1	0	0
33	Beech	0.08	/	0	1	0	1	1	1
34	Beech	0.07	0	0	1	0	0	0	0
35	Oak	0.54	/	3	3	3	3	0	2
36	?Goats willow	0.59	/	1	1	0	1	0	1
37	Beech	0.11	/	0	1	0	1	1	1
38	Beech	1.37	1	1	1	1	0	1	0
39	?Goats willow	0.28	/	0	0	0	0	0	0
40	Silver birch	0.39	/	2	2	2	1	0	0

Tree No.	Species	Girth /m	02/09/94	16/09/94	27/10/94	10/11/94	23/11/94	09/12/94
1.1	Beech	1.18	1	0	1	0	0	0
1.2	Beech	1.07	1	1	0	0	0	0
1.3	Beech	0.72	1	0	0	0	0	0
2	Beech	0.04	0	0	0	0	0	0
3	?Goats willow	0.09	0	0	0	0	0	0
4	Silver birch	0.05	0	0	0	0	0	0
5.1	?Goats willow	0.31	2	1	0	0	0	0
5.2	?Goats willow	0.18	1	0	0	0	0	0
6	Oak	1.74	3	3	0	1	0	0
7	?Goats willow	0.2	1	0	0	0	0	0
8	Silver birch	0.06	0	0	0	0	0	0
9	Beech	0.89	2	1	0	0	0	0
10	Beech	1.56	2	2	0	0	1	0
11	Oak	1.69	3	3	1	0	0	0
12	Silver birch	0.2	0	0	0	1	0	0
13.1	Beech	1.72	2	1	0	0	1	0
13.2	Beech	0.75	1	0	1	0	0	0
14	Beech	0.05	0	0	0	0	0	0
15	?Goats willow	0.25	0	1	0	0	0	0
16	Silver birch	0.07	0	0	0	0	0	0
17	Silver birch	0.06	0	0	0	0	0	0
18.1	?Goats willow	0.35	0	0	0	0	0	0
18.2	?Goats willow	0.28	0	0	0	0	0	0
19	Silver birch	0.06	0	0	0	0	0	0
20	Silver birch	0.06	0	0	0	0	0	0
21	Beech	1.87	3	3	1	1	1	0
22	Silver birch	0.54	2	1	1	1	1	0
23	Silver birch	0.19	0	1	0	0	0	0
24	Silver birch	0.19	0	1	0	0	1	0
25	Silver birch	0.2	0	0	0	0	0	0
26	Silver birch	0.08	0	0	0	0	0	0
27	?Goats willow	0.32	1	1	0	0	0	0
28	?Goats willow	0.27	1	0	0	0	0	0
29	Beech	0.05	0	0	0	0	0	0
30.1	Oak	1.01	3	3	1	0	0	0
30.2	Oak	0.72	0	2	0	0	0	0
30.3	Oak	1.04	3	3	1	0	0	0
31.1	Oak	1.54	3	3	0	1	0	0
31.2	Oak	1.46	3	3	0	0	0	0
32	Silver birch	1.29	1	0	0	0	0	0
33	Beech	0.08	0	1	0	1	0	0
34	Beech	0.07	0	0	0	0	0	0
35	Oak	0.54	1	1	0	0	0	0
36	?Goats willow	0.59	1	0	0	0	0	0
37	Beech	0.11	1	2	0	0	0	0
38	Beech	1.37	0	1	0	0	0	0
39	?Goats willow	0.28	0	0	0	0	0	0
40	Silver birch	0.39	0	1	0	0	0	0

Halse grid 1, trees 1 to 40 (1995)

Tree No.	Species	Girth /m	04/01/95	08/02/95	08/03/95	22/03/95	07/04/95	12/04/95
1.1	Beech	1.18	0	0	0	0	1	1
1.2	Beech	1.07	0	0	0	0	0	1
1.3	Beech	0.72	0	0	0	0	0	0
2	Beech	0.04	0	0	0	0	0	0
3	?Goats willow	0.09	0	0	0	0	0	1
4	Silver birch	0.05	0	0	0	0	0	0
5.1	?Goats willow	0.31	0	0	0	0	1	1
5.2	?Goats willow	0.18	0	0	0	0	1	0
6	Oak	1.74	0	0	0	2	3	3
7	?Goats willow	0.2	0	0	0	1	1	2
8	Silver birch	0.06	0	0	0	0	0	0
9	Beech	0.89	0	0	0	0	0	1
10	Beech	1.56	0	0	0	2	1	1
11	Oak	1.69	0	0	0	2	3	2
12	Silver birch	0.2	0	0	0	1	1	0
13.1	Beech	1.72	0	0	0	2	1	2
13.2	Beech	0.75	0	0	0	2	0	1
14	Beech	0.05	0	0	0	0	0	0
15	?Goats willow	0.25	0	0	0	0	0	1
16	Silver birch	0.07	0	0	0	0	1	0
17	Silver birch	0.06	0	0	0	1	0	0
18.1	?Goats willow	0.35	0	0	0	1	2	0
18.2	?Goats willow	0.28	0	0	0	1	2	1
19	Silver birch	0.06	0	0	0	0	0	0
20	Silver birch	0.06	0	0	0	1	1	0
21	Beech	1.87	0	0	0	3	1	2
22	Silver birch	0.54	0	0	0	5	2	2
23	Silver birch	0.19	0	0	0	5	1	2
24	Silver birch	0.19	0	0	0	3	1	0
25	Silver birch	0.2	0	0	0	3	1	1
26	Silver birch	0.08	0	0	0	1	0	0
27	?Goats willow	0.32	0	0	0	0	3	1
28	?Goats willow	0.27	0	0	0	0	3	2
29	Beech	0.05	0	0	0	0	0	0
30.1	Oak	1.01	0	0	0	0	3	3
30.2	Oak	0.72	0	0	0	0	2	2
30.3	Oak	1.04	0	0	0	0	2	3
31.1	Oak	1.54	0	0	0	0	3	3
31.2	Oak	1.46	0	0	0	0	3	3
32	Silver birch	1.29	0	0	0	0	1	1
33	Beech	0.08	0	0	0	0	0	0
34	Beech	0.07	0	0	0	0	0	1
35	Oak	0.54	0	0	0	0	1	1
36	?Goats willow	0.59	0	0	0	1	2	1
37	Beech	0.11	0	0	0	0	2	1
38	Beech	1.37	0	0	0	0	1	0
39	?Goats willow	0.28	0	0	0	0	0	0
40	Silver birch	0.39	0	0	0	0	1	0

Tree No.	Species	Girth /m	20/04/95	04/05/95	11/05/95	18/05/95	24/05/95	31/05/95
1.1	Beech	1.18	1	1	0	0	0	0
1.2	Beech	1.07	1	1	0	0	0	0
1.3	Beech	0.72	1	0	0	0	0	1
2	Beech	0.04	0	0	0	0	0	0
3	?Goats willow	0.09	0	0	0	0	0	1
4	Silver birch	0.05	1	0	0	0	0	0
5.1	?Goats willow	0.31	1	0	1	2	1	1
5.2	?Goats willow	0.18	0	1	1	1	1	1
6	Oak	1.74	3	3	3	3	3	3
7	?Goats willow	0.2	1	0	2	2	1	1
8	Silver birch	0.06	0	0	0	0	0	0
9	Beech	0.89	1	0	0	1	1	0
10	Beech	1.56	1	0	1	0	0	1
11	Oak	1.69	2	3	2	3	3	3
12	Silver birch	0.2	1	0	0	1	0	1
13.1	Beech	1.72	2	1	1	1	1	2
13.2	Beech	0.75	1	0	0	0	0	1
14	Beech	0.05	1	0	0	0	0	0
15	?Goats willow	0.25	1	0	0	0	0	0
16	Silver birch	0.07	0	0	0	0	0	0
17	Silver birch	0.06	0	0	0	0	0	0
18.1	?Goats willow	0.35	1	0	0	1	2	2
18.2	?Goats willow	0.28	2	0	1	2	2	1
19	Silver birch	0.06	0	0	0	0	0	0
20	Silver birch	0.06	0	0	0	0	0	0
21	Beech	1.87	2	2	1	2	0	1
22	Silver birch	0.54	2	2	1	3	2	2
23	Silver birch	0.19	0	1	1	2	1	1
24	Silver birch	0.19	1	1	0	1	0	0
25	Silver birch	0.2	0	1	0	1	1	1
26	Silver birch	0.08	0	0	0	1	0	1
27	?Goats willow	0.32	1	2	0	1	2	2
28	?Goats willow	0.27	1	1	1	2	2	1
29	Beech	0.05	0	0	0	0	0	1
30.1	Oak	1.01	2	3	2	1	2	2
30.2	Oak	0.72	2	2	0	1	1	1
30.3	Oak	1.04	2	2	2	1	2	1
31.1	Oak	1.54	3	3	3	3	3	3
31.2	Oak	1.46	3	3	3	3	3	2
32	Silver birch	1.29	1	0	0	1	0	1
33	Beech	0.08	0	0	1	0	1	1
34	Beech	0.07	0	0	0	0	1	1
35	Oak	0.54	1	1	1	1	1	1
36	?Goats willow	0.59	2	1	1	1	0	1
37	Beech	0.11	1	0	1	1	1	2
38	Beech	1.37	1	1	0	0	0	1
39	?Goats willow	0.28	1	0	0	1	0	0
40	Silver birch	0.39	1	0	0	0	0	0

Tree No.	Species	Girth /m	08/06/95	13/06/95	21/06/95	28/06/95	05/07/95	12/07/95
1.1	Beech	1.18	1	0	1	0	1	1
1.2	Beech	1.07	1	1	1	1	1	0
1.3	Beech	0.72	0	0	1	0	1	0
2	Beech	0.04	0	0	0	0	0	0
3	?Goats willow	0.09	0	0	0	0	0	0
4	Silver birch	0.05	0	0	0	0	1	0
5.1	?Goats willow	0.31	1	2	1	0	1	1
5.2	?Goats willow	0.18	0	0	1	1	0	0
6	Oak	1.74	3	3	2	1	2	1
7	?Goats willow	0.2	0	2	1	1	1	0
8	Silver birch	0.06	1	0	0	0	0	0
9	Beech	0.89	1	0	1	0	0	1
10	Beech	1.56	1	2	1	1	2	1
11	Oak	1.69	3	3	3	3	2	2
12	Silver birch	0.2	0	1	1	1	1	1
13.1	Beech	1.72	2	2	1	2	1	2
13.2	Beech	0.75	1	1	1	1	1	1
14	Beech	0.05	0	0	0	0	1	0
15	?Goats willow	0.25	0	0	0	0	0	0
16	Silver birch	0.07	0	0	0	0	0	1
17	Silver birch	0.06	0	0	0	0	0	0
18.1	?Goats willow	0.35	2	1	1	0	0	0
18.2	?Goats willow	0.28	2	1	1	0	0	0
19	Silver birch	0.06	1	0	0	0	1	0
20	Silver birch	0.06	1	1	1	0	0	1
21	Beech	1.87	2	1	2	2	2	2
22	Silver birch	0.54	3	2	2	2	2	2
23	Silver birch	0.19	3	3	1	1	2	1
24	Silver birch	0.19	0	1	1	1	1	1
25	Silver birch	0.2	1	2	1	1	2	1
26	Silver birch	0.08	1	1	1	0	0	1
27	?Goats willow	0.32	2	2	0	1	1	2
28	?Goats willow	0.27	2	2	0	1	1	1
29	Beech	0.05	0	1	0	0	1	0
30.1	Oak	1.01	1	1	2	2	3	2
30.2	Oak	0.72	2	0	2	1	1	1
30.3	Oak	1.04	1	0	2	2	0	2
31.1	Oak	1.54	3	2	2	2	2	1
31.2	Oak	1.46	3	2	1	1	1	1
32	Silver birch	1.29	1	0	0	0	0	1
33	Beech	0.08	0	0	0	0	1	1
34	Beech	0.07	1	1	0	0	1	0
35	Oak	0.54	2	2	1	1	1	1
36	?Goats willow	0.59	0	1	1	0	1	1
37	Beech	0.11	2	1	0	0	1	1
38	Beech	1.37	0	1	1	1	1	1
39	?Goats willow	0.28	0	0	0	0	0	1
40	Silver birch	0.39	0	0	0	0	0	1

Tree No.	Species	Girth /m	19/07/95	26/07/95	03/08/95	09/08/95	16/08/95	23/08/95
1.1	Beech	1.18	2	2	1	1	1	2
1.2	Beech	1.07	2	2	1	1	1	1
1.3	Beech	0.72	2	1	0	1	1	0
2	Beech	0.04	1	0	0	0	0	0
3	?Goats willow	0.09	0	0	0	0	0	0
4	Silver birch	0.05	1	1	0	0	0	0
5.1	?Goats willow	0.31	1	1	1	0	0	1
5.2	?Goats willow	0.18	1	1	0	0	0	0
6	Oak	1.74	2	2	2	1	1	3
7	?Goats willow	0.2	1	1	1	1	0	1
8	Silver birch	0.06	0	0	0	0	0	0
9	Beech	0.89	1	1	1	0	0	0
10	Beech	1.56	2	3	1	1	0	1
11	Oak	1.69	2	3	1	2	2	3
12	Silver birch	0.2	0	0	0	0	0	0
13.1	Beech	1.72	3	3	1	1	0	1
13.2	Beech	0.75	2	2	1	1	0	1
14	Beech	0.05	0	0	0	0	0	0
15	?Goats willow	0.25	1	0	0	0	0	0
16	Silver birch	0.07	0	0	0	0	0	0
17	Silver birch	0.06	1	1	0	0	0	0
18.1	?Goats willow	0.35	1	0	0	0	0	0
18.2	?Goats willow	0.28	1	0	0	0	0	0
19	Silver birch	0.06	1	0	0	0	0	0
20	Silver birch	0.06	0	0	0	0	0	0
21	Beech	1.87	3	3	2	0	2	2
22	Silver birch	0.54	2	2	1	0	1	1
23	Silver birch	0.19	1	1	1	0	0	0
24	Silver birch	0.19	1	1	1	0	0	1
25	Silver birch	0.2	1	2	1	1	0	0
26	Silver birch	0.08	1	1	0	0	0	0
27	?Goats willow	0.32	0	1	1	0	0	1
28	?Goats willow	0.27	0	1	1	0	0	1
29	Beech	0.05	0	1	0	0	0	0
30.1	Oak	1.01	2	3	1	1	2	3
30.2	Oak	0.72	1	2	0	1	2	0
30.3	Oak	1.04	2	3	1	2	2	3
31.1	Oak	1.54	2	3	1	1	1	3
31.2	Oak	1.46	2	3	1	1	2	3
32	Silver birch	1.29	1	0	0	0	0	0
33	Beech	0.08	1	1	0	0	0	0
34	Beech	0.07	1	1	0	0	0	0
35	Oak	0.54	1	1	1	0	1	2
36	?Goats willow	0.59	1	1	0	0	0	0
37	Beech	0.11	1	1	1	0	0	1
38	Beech	1.37	2	2	0	0	1	0
39	?Goats willow	0.28	1	1	0	0	0	0
40	Silver birch	0.39	0	1	0	1	0	0

Tree No.	Species	Girth /m	30/08/95	06/09/95	13/09/95	20/09/95	27/09/95	11/10/95
1.1	Beech	1.18	1	1	0	1	1	0
1.2	Beech	1.07	1	1	0	0	1	0
1.3	Beech	0.72	0	0	0	0	0	0
2	Beech	0.04	1	0	0	0	0	0
3	?Goats willow	0.09	1	0	0	0	0	0
4	Silver birch	0.05	1	0	0	0	0	0
5.1	?Goats willow	0.31	0	0	0	0	0	0
5.2	?Goats willow	0.18	0	0	0	0	0	0
6	Oak	1.74	3	3	2	2	2	2
7	?Goats willow	0.2	1	0	0	0	0	0
8	Silver birch	0.06	0	0	0	0	0	0
9	Beech	0.89	0	0	0	0	1	0
10	Beech	1.56	1	1	0	2	1	1
11	Oak	1.69	3	3	2	3	3	3
12	Silver birch	0.2	0	0	0	0	0	0
13.1	Beech	1.72	1	1	2	2	2	1
13.2	Beech	0.75	0	0	0	0	0	1
14	Beech	0.05	0	0	0	0	0	0
15	?Goats willow	0.25	0	0	0	0	0	0
16	Silver birch	0.07	0	0	0	0	0	0
17	Silver birch	0.06	0	0	0	0	0	0
18.1	?Goats willow	0.35	0	0	0	1	0	0
18.2	?Goats willow	0.28	0	1	0	0	0	1
19	Silver birch	0.06	0	0	0	0	0	0
20	Silver birch	0.06	0	0	0	0	0	0
21	Beech	1.87	2	2	3	2	2	2
22	Silver birch	0.54	0	1	1	0	0	0
23	Silver birch	0.19	0	0	0	0	1	0
24	Silver birch	0.19	0	0	1	1	0	0
25	Silver birch	0.2	0	0	0	0	0	0
26	Silver birch	0.08	0	0	0	0	0	0
27	?Goats willow	0.32	0	1	1	1	0	1
28	?Goats willow	0.27	0	1	0	0	0	1
29	Beech	0.05	0	0	0	0	0	1
30.1	Oak	1.01	3	3	3	3	3	1
30.2	Oak	0.72	0	0	0	0	0	0
30.3	Oak	1.04	3	3	3	3	3	1
31.1	Oak	1.54	3	3	3	3	3	2
31.2	Oak	1.46	3	3	3	3	3	2
32	Silver birch	1.29	0	1	0	0	0	0
33	Beech	0.08	0	0	1	0	0	0
34	Beech	0.07	0	0	1	0	0	0
35	Oak	0.54	1	2	1	1	2	0
36	?Goats willow	0.59	1	0	1	0	0	0
37	Beech	0.11	0	1	0	0	1	1
38	Beech	1.37	1	1	0	1	0	0
39	?Goats willow	0.28	0	0	0	0	0	0
40	Silver birch	0.39	0	0	0	0	0	0

Tree No.	Species	Girth /m	18/10/95	25/10/95	01/11/95	08/11/95	15/11/95	22/11/95	29/11/95
1.1	Beech	1.18	0	0	0	0	0	0	0
1.2	Beech	1.07	0	0	0	0	0	0	0
1.3	Beech	0.72	0	0	0	0	0	0	0
2	Beech	0.04	0	1	0	0	0	0	0
3	?Goats willow	0.09	0	0	0	0	0	0	0
4	Silver birch	0.05	0	0	0	0	0	0	0
5.1	?Goats willow	0.31	0	0	0	0	0	0	0
5.2	?Goats willow	0.18	0	0	0	0	0	0	0
6	Oak	1.74	1	0	0	0	0	0	0
7	?Goats willow	0.2	0	0	0	0	0	0	0
8	Silver birch	0.06	0	0	0	0	0	0	0
9	Beech	0.89	1	1	0	0	0	0	0
10	Beech	1.56	0	1	0	0	0	0	0
11	Oak	1.69	3	2	1	0	0	0	0
12	Silver birch	0.2	0	0	0	0	0	0	0
13.1	Beech	1.72	2	1	0	1	0	0	0
13.2	Beech	0.75	0	1	0	0	0	0	0
14	Beech	0.05	0	0	0	0	0	0	0
15	?Goats willow	0.25	0	0	0	0	0	0	0
16	Silver birch	0.07	0	0	0	0	0	0	0
17	Silver birch	0.06	0	0	0	0	0	0	0
18.1	?Goats willow	0.35	0	0	0	0	0	0	0
18.2	?Goats willow	0.28	0	1	0	0	0	0	0
19	Silver birch	0.06	0	0	0	0	0	0	0
20	Silver birch	0.06	0	0	0	0	0	0	0
21	Beech	1.87	1	2	0	1	0	1	0
22	Silver birch	0.54	0	0	1	0	0	1	0
23	Silver birch	0.19	0	0	0	0	0	0	0
24	Silver birch	0.19	0	0	0	0	0	0	0
25	Silver birch	0.2	0	0	0	0	0	0	0
26	Silver birch	0.08	0	0	0	0	0	0	0
27	?Goats willow	0.32	2	1	0	1	0	0	0
28	?Goats willow	0.27	0	1	0	0	0	0	0
29	Beech	0.05	1	1	0	1	0	0	0
30.1	Oak	1.01	1	0	1	0	0	0	0
30.2	Oak	0.72	0	0	1	0	0	0	0
30.3	Oak	1.04	1	0	0	0	0	0	0
31.1	Oak	1.54	1	0	0	0	0	0	0
31.2	Oak	1.46	1	1	0	0	0	0	0
32	Silver birch	1.29	0	0	0	0	0	0	0
33	Beech	0.08	0	0	0	0	0	0	0
34	Beech	0.07	0	0	0	0	0	0	0
35	Oak	0.54	0	0	0	0	0	0	0
36	?Goats willow	0.59	0	0	0	0	0	0	0
37	Beech	0.11	1	0	0	1	0	0	0
38	Beech	1.37	0	0	0	0	0	0	0
39	?Goats willow	0.28	0	0	0	0	0	0	0
40	Silver birch	0.39	0	0	0	0	0	0	0

Halse grid 1, trees 1 to 40 (1996)

Tree No.	Species	Girth /m	10/01/96	17/01/96	31/01/96	14/02/96	28/02/96	13/03/96
1.1	Beech	1.18	0	0	0	0	0	0
1.2	Beech	1.07	0	0	0	0	0	0
1.3	Beech	0.72	0	0	0	0	0	0
2	Beech	0.04	0	0	0	0	0	0
3	?Goats willow	0.09	0	0	0	0	0	0
4	Silver birch	0.05	0	0	0	0	0	0
5.1	?Goats willow	0.31	0	0	0	0	0	0
5.2	?Goats willow	0.18	0	0	0	0	0	0
6	Oak	1.74	0	0	0	0	0	0
7	?Goats willow	0.2	0	0	0	0	0	0
8	Silver birch	0.06	0	0	0	0	0	0
9	Beech	0.89	0	0	0	0	0	0
10	Beech	1.56	0	0	0	0	0	0
11	Oak	1.69	0	0	0	0	0	0
12	Silver birch	0.2	0	0	0	0	0	0
13.1	Beech	1.72	0	0	0	0	0	0
13.2	Beech	0.75	0	0	0	0	0	0
14	Beech	0.05	0	0	0	0	0	0
15	?Goats willow	0.25	0	0	0	0	0	0
16	Silver birch	0.07	0	0	0	0	0	0
17	Silver birch	0.06	0	0	0	0	0	0
18.1	?Goats willow	0.35	0	0	0	0	0	0
18.2	?Goats willow	0.28	0	0	0	0	0	0
19	Silver birch	0.06	0	0	0	0	0	0
20	Silver birch	0.06	0	0	0	0	0	0
21	Beech	1.87	0	0	0	0	0	0
22	Silver birch	0.54	0	0	0	0	0	0
23	Silver birch	0.19	0	0	0	0	0	0
24	Silver birch	0.19	0	0	0	0	0	0
25	Silver birch	0.2	0	0	0	0	0	0
26	Silver birch	0.08	0	0	0	0	0	0
27	?Goats willow	0.32	0	0	0	0	0	0
28	?Goats willow	0.27	0	0	0	0	0	0
29	Beech	0.05	0	0	0	0	0	0
30.1	Oak	1.01	0	0	0	0	0	0
30.2	Oak	0.72	0	0	0	0	0	0
30.3	Oak	1.04	0	0	0	0	0	0
31.1	Oak	1.54	0	0	0	0	0	0
31.2	Oak	1.46	0	0	0	0	0	0
32	Silver birch	1.29	0	0	0	0	0	0
33	Beech	0.08	0	0	0	0	0	0
34	Beech	0.07	0	0	0	0	0	0
35	Oak	0.54	0	0	0	0	0	0
36	?Goats willow	0.59	0	0	0	0	0	0
37	Beech	0.11	0	0	0	0	0	0
38	Beech	1.37	0	0	0	0	0	0
39	?Goats willow	0.28	0	0	0	0	0	0
40	Silver birch	0.39	0	0	0	0	0	0

Tree No.	Species	Girth /m	27/03/96	03/04/96	17/04/96	01/05/96	15/05/96	22/05/96
1.1	Beech	1.18	0	1	0	1	1	0
1.2	Beech	1.07	0	0	0	0	1	0
1.3	Beech	0.72	0	0	0	0	1	0
2	Beech	0.04	0	0	0	0	0	0
3	?Goats willow	0.09	0	0	1	0	0	0
4	Silver birch	0.05	0	0	0	0	0	0
5.1	?Goats willow	0.31	0	0	2	0	1	0
5.2	?Goats willow	0.18	0	0	1	0	0	0
6	Oak	1.74	0	0	2	0	1	1
7	?Goats willow	0.2	0	0	2	0	0	0
8	Silver birch	0.06	0	0	0	0	0	0
9	Beech	0.89	0	0	0	0	1	1
10	Beech	1.56	0	0	0	0	1	1
11	Oak	1.69	0	0	1	2	3	3
12	Silver birch	0.2	0	1	2	0	0	0
13.1	Beech	1.72	0	3	2	1	0	0
13.2	Beech	0.75	0	1	2	0	0	0
14	Beech	0.05	0	0	0	0	0	0
15	?Goats willow	0.25	0	0	0	0	0	0
16	Silver birch	0.07	0	0	0	0	0	0
17	Silver birch	0.06	0	0	0	0	0	0
18.1	?Goats willow	0.35	0	0	2	0	1	0
18.2	?Goats willow	0.28	0	0	2	0	0	0
19	Silver birch	0.06	0	0	0	0	0	0
20	Silver birch	0.06	0	0	0	0	0	0
21	Beech	1.87	0	3	2	1	1	1
22	Silver birch	0.54	0	2	2	2	1	1
23	Silver birch	0.19	0	1	2	0	1	0
24	Silver birch	0.19	0	1	2	1	0	1
25	Silver birch	0.2	0	1	2	1	0	1
26	Silver birch	0.08	0	0	1	0	0	0
27	?Goats willow	0.32	0	0	3	0	0	0
28	?Goats willow	0.27	0	0	2	0	0	0
29	Beech	0.05	0	0	0	0	0	0
30.1	Oak	1.01	0	1	1	1	2	1
30.2	Oak	0.72	0	0	0	1	1	1
30.3	Oak	1.04	0	0	1	1	2	0
31.1	Oak	1.54	0	0	0	2	3	2
31.2	Oak	1.46	0	1	1	2	3	2
32	Silver birch	1.29	0	0	1	0	1	0
33	Beech	0.08	0	0	1	0	0	0
34	Beech	0.07	0	0	0	0	0	0
35	Oak	0.54	0	0	1	0	1	1
36	?Goats willow	0.59	0	1	1	0	0	1
37	Beech	0.11	0	1	1	0	0	0
38	Beech	1.37	0	1	1	0	0	0
39	?Goats willow	0.28	0	0	1	0	0	0
40	Silver birch	0.39	0	0	1	0	0	0

Tree No.	Species	Girth /m	02/06/96	24/06/96
1.1	Beech	1.18	0	1
1.2	Beech	1.07	0	1
1.3	Beech	0.72	0	1
2	Beech	0.04	0	0
3	?Goats willow	0.09	0	0
4	Silver birch	0.05	0	0
5.1	?Goats willow	0.31	1	0
5.2	?Goats willow	0.18	1	0
6	Oak	1.74	2	3
7	?Goats willow	0.2	0	0
8	Silver birch	0.06	0	0
9	Beech	0.89	1	0
10	Beech	1.56	0	1
11	Oak	1.69	4	1
12	Silver birch	0.2	0	0
13.1	Beech	1.72	0	0
13.2	Beech	0.75	0	0
14	Beech	0.05	0	0
15	?Goats willow	0.25	0	0
16	Silver birch	0.07	0	0
17	Silver birch	0.06	0	0
18.1	?Goats willow	0.35	1	0
18.2	?Goats willow	0.28	0	0
19	Silver birch	0.06	0	0
20	Silver birch	0.06	0	0
21	Beech	1.87	1	2
22	Silver birch	0.54	0	2
23	Silver birch	0.19	0	1
24	Silver birch	0.19	0	0
25	Silver birch	0.2	0	0
26	Silver birch	0.08	1	0
27	?Goats willow	0.32	1	0
28	?Goats willow	0.27	2	0
29	Beech	0.05	0	0
30.1	Oak	1.01	1	3
30.2	Oak	0.72	0	1
30.3	Oak	1.04	1	2
31.1	Oak	1.54	3	2
31.2	Oak	1.46	4	2
32	Silver birch	1.29	1	2
33	Beech	0.08	0	0
34	Beech	0.07	0	0
35	Oak	0.54	2	1
36	?Goats willow	0.59	0	1
37	Beech	0.11	1	0
38	Beech	1.37	0	0
39	?Goats willow	0.28	0	0
40	Silver birch	0.39	1	0

Halse grid 1, trees 41 to 60 (1994)

Tree No.	Species	Girth /m	23/05/94	02/06/94	16/06/94	30/06/94	14/07/94	28/07/94	12/08/94
41	Beech	3.36	1	1	1	2	1	1	0
42	Beech	1.55	1	1	1	1	1	1	1
43	Oak	1.17	3	3	3	3	4	3	3
44	Beech	1.22	1	1	1	2	1	1	1
45	Beech	1.6	2	2	2	3	1	3	3
46	Oak	1.13	2	1	3	4	4	3	3
47	Beech	2.42	0	1	1	1	2	1	1
48	Beech	1.3	0	1	1	1	1	0	0
49	Beech	1.3	1	1	2	2	1	1	2
50	Beech	1.1	1	1	1	1	2	1	0
51	Silver birch	0.59	dead	dead	dead	dead	dead	dead	dead
52	Beech	2.47	1	1	2	3	3	3	3
53	Oak	1.51	/	/	4	4	5	5	5
54.1	Beech	2.1	1	1	1	1	1	1	0
54.2	Beech	0.52	0	1	0	0	0	0	0
55	Oak	1.99	3	4	4	4	5	3	3
56	Silver birch	0.87	/	1	1	1	0	0	0
57	Beech	2.3	1	2	2	2	2	2	3
58	Beech	1.52	0	1	1	1	1	0	1
59	Beech	1.58	1	0	1	1	1	0	0
60	Whitebeam	1.15	1	0	1	0	1	0	0
164	Oak		/	/	/	/	/	/	/

Tree No.	Species	Girth /m	02/09/94	16/09/94	27/10/94	10/11/94	23/11/94	09/12/94
41	Beech	3.36	0	0	0	0	0	0
42	Beech	1.55	1	1	0	0	0	0
43	Oak	1.17	3	1	0	0	1	0
44	Beech	1.22	0	1	0	0	1	0
45	Beech	1.6	3	3	0	0	1	0
46	Oak	1.13	3	2	0	0	0	0
47	Beech	2.42	0	0	0	0	0	0
48	Beech	1.3	0	0	0	0	0	0
49	Beech	1.3	2	1	0	0	0	0
50	Beech	1.1	0	0	0	0	0	0
51	Silver birch	0.59	dead	dead	dead	dead	dead	dead
52	Beech	2.47	3	3	1	0	1	0
53	Oak	1.51	4	3	3	1	1	0
54.1	Beech	2.1	1	1	0	0	0	0
54.2	Beech	0.52	0	0	0	0	0	0
55	Oak	1.99	4	3	0	0	0	0
56	Silver birch	0.87	0	0	0	0	0	0
57	Beech	2.3	1	2	0	0	0	0
58	Beech	1.52	0	1	0	0	0	0
59	Beech	1.58	0	1	0	0	0	0
60	Whitebeam	1.15	0	0	0	0	0	0
164	Oak		1	1	0	0	0	0

Halse grid 1, trees 41 to 60 1995)

Tree No.	Species	Girth /m	04/01/95	08/02/95	08/03/95	22/03/95	07/04/95	12/04/95
41	Beech	3.36	0	0	0	0	1	0
42	Beech	1.55	0	0	0	1	1	0
43	Oak	1.17	0	0	0	0	3	3
44	Beech	1.22	0	0	0	0	1	1
45	Beech	1.6	0	0	0	1	3	2
46	Oak	1.13	0	0	0	0	3	3
47	Beech	2.42	0	0	0	1	0	1
48	Beech	1.3	0	0	0	1	1	1
49	Beech	1.3	0	0	0	1	1	1
50	Beech	1.1	0	0	0	1	0	1
51	Silver birch	0.59	dead	dead	dead	dead	dead	dead
52	Beech	2.47	0	0	0	2	2	2
53	Oak	1.51	0	0	0	2	3	3
54.1	Beech	2.1	0	0	0	0	1	1
54.2	Beech	0.52	0	0	0	0	0	0
55	Oak	1.99	0	0	0	0	3	3
56	Silver birch	0.87	0	0	0	0	0	0
57	Beech	2.3	0	0	0	2	2	1
58	Beech	1.52	0	0	0	1	1	1
59	Beech	1.58	0	0	0	1	1	2
60	Whitebeam	1.15	0	0	0	0	0	0
164	Oak		0	0	0	0	3	2

Tree No.	Species	Girth /m	20/04/95	04/05/95	11/05/95	18/05/95	24/05/95	31/05/95
41	Beech	3.36	1	1	0	1	0	1
42	Beech	1.55	0	0	0	1	0	1
43	Oak	1.17	1	2	1	2	1	2
44	Beech	1.22	1	1	1	1	1	1
45	Beech	1.6	2	2	1	2	1	1
46	Oak	1.13	3	3	2	3	2	2
47	Beech	2.42	1	0	0	0	1	0
48	Beech	1.3	1	1	0	1	1	1
49	Beech	1.3	0	1	1	1	0	2
50	Beech	1.1	1	0	0	1	0	1
51	Silver birch	0.59	dead	dead	dead	dead	dead	dead
52	Beech	2.47	3	1	1	2	2	2
53	Oak	1.51	4	3	3	3	3	3
54.1	Beech	2.1	1	1	0	0	0	1
54.2	Beech	0.52	0	0	0	1	0	1
55	Oak	1.99	3	3	2	3	3	2
56	Silver birch	0.87	1	0	0	0	0	1
57	Beech	2.3	2	1	1	1	0	1
58	Beech	1.52	1	1	0	1	1	2
59	Beech	1.58	1	0	0	0	0	0
60	Whitebeam	1.15	0	0	0	0	1	0
164	Oak		1	1	3	2	2	2

Tree No.	Species	Girth /m	08/06/95	13/06/95	21/06/95	28/06/95	05/07/95	12/07/95
41	Beech	3.36	0	1	1	1	1	0
42	Beech	1.55	2	1	1	1	1	1
43	Oak	1.17	2	2	2	2	1	1
44	Beech	1.22	1	1	1	1	1	1
45	Beech	1.6	2	1	2	1	1	1
46	Oak	1.13	2	1	2	2	2	3
47	Beech	2.42	0	0	1	1	1	1
48	Beech	1.3	1	0	1	0	1	1
49	Beech	1.3	0	1	1	1	1	1
50	Beech	1.1	1	0	1	1	1	1
51	Silver birch	0.59	dead	dead	dead	dead	dead	dead
52	Beech	2.47	3	2	1	1	2	2
53	Oak	1.51	3	3	2	2	2	2
54.1	Beech	2.1	1	0	1	1	1	2
54.2	Beech	0.52	0	0	0	0	1	1
55	Oak	1.99	3	2	2	2	2	1
56	Silver birch	0.87	0	0	0	0	1	0
57	Beech	2.3	0	0	1	1	2	1
58	Beech	1.52	2	0	1	1	1	1
59	Beech	1.58	0	0	1	0	1	1
60	Whitebeam	1.15	0	0	0	0	0	1
164	Oak		2	1	2	1	1	1

Tree No.	Species	Girth /m	19/07/95	26/07/95	03/08/95	09/08/95	16/08/95	23/08/95
41	Beech	3.36	1	1	1	0	2	0
42	Beech	1.55	2	1	1	1	1	1
43	Oak	1.17	1	2	1	1	1	2
44	Beech	1.22	1	2	1	1	1	0
45	Beech	1.6	3	2	2	1	2	0
46	Oak	1.13	3	3	3	2	1	3
47	Beech	2.42	2	2	2	0	1	1
48	Beech	1.3	1	2	0	0	0	0
49	Beech	1.3	2	3	1	1	2	2
50	Beech	1.1	1	2	1	1	0	1
51	Silver birch	0.59	dead	dead	dead	dead	dead	dead
52	Beech	2.47	3	3	0	0	0	3
53	Oak	1.51	3	3	1	1	1	3
54.1	Beech	2.1	3	1	1	0	0	0
54.2	Beech	0.52	2	1	0	0	0	0
55	Oak	1.99	2	3	2	2	2	3
56	Silver birch	0.87	1	1	0	0	0	0
57	Beech	2.3	1	3	1	1	1	1
58	Beech	1.52	2	2	0	1	1	1
59	Beech	1.58	2	2	0	0	1	1
60	Whitebeam	1.15	0	1	0	1	0	0
164	Oak		1	2	1	0	1	2

Tree No.	Species	Girth /m	30/08/95	06/09/95	13/09/95	20/09/95	27/09/95	11/10/95
41	Beech	3.36	1	0	0	0	1	1
42	Beech	1.55	1	1	1	1	1	0
43	Oak	1.17	1	0	2	1	1	1
44	Beech	1.22	0	0	1	0	0	0
45	Beech	1.6	1	2	0	1	1	2
46	Oak	1.13	3	3	2	2	3	3
47	Beech	2.42	1	1	0	1	0	1
48	Beech	1.3	0	1	0	1	1	1
49	Beech	1.3	1	1	1	1	1	1
50	Beech	1.1	0	1	0	0	0	0
51	Silver birch	0.59	dead	dead	dead	dead	dead	dead
52	Beech	2.47	2	3	3	3	2	3
53	Oak	1.51	3	3	3	3	1	3
54.1	Beech	2.1	1	0	1	0	0	0
54.2	Beech	0.52	0	0	0	0	0	0
55	Oak	1.99	3	2	2	3	3	2
56	Silver birch	0.87	0	0	0	0	0	0
57	Beech	2.3	1	1	1	3	2	1
58	Beech	1.52	0	1	1	0	0	0
59	Beech	1.58	0	0	0	1	0	0
60	Whitebeam	1.15	0	0	0	0	0	0
164	Oak		1	2	0	2	1	2

Tree No.	Species	Girth /m	18/10/95	25/10/95	01/11/95	08/11/95	15/11/95	22/11/95	29/11/95
41	Beech	3.36	0	0	0	0	0	0	0
42	Beech	1.55	0	0	0	0	0	1	0
43	Oak	1.17	1	1	1	0	0	0	0
44	Beech	1.22	0	0	0	0	0	0	0
45	Beech	1.6	1	1	0	0	0	0	0
46	Oak	1.13	3	2	2	0	0	0	0
47	Beech	2.42	1	1	1	0	0	0	0
48	Beech	1.3	0	1	0	0	0	0	1
49	Beech	1.3	1	0	1	0	0	0	0
50	Beech	1.1	1	1	0	1	0	0	0
51	Silver birch	0.59	dead	dead	dead	dead	dead	dead	dead
52	Beech	2.47	3	2	1	0	0	1	0
53	Oak	1.51	3	2	2	2	1	0	0
54.1	Beech	2.1	0	0	0	1	0	0	0
54.2	Beech	0.52	0	0	0	0	0	0	0
55	Oak	1.99	2	1	1	0	0	0	0
56	Silver birch	0.87	0	0	0	0	0	0	0
57	Beech	2.3	0	1	0	0	0	1	0
58	Beech	1.52	0	0	0	0	0	0	0
59	Beech	1.58	0	0	1	0	0	0	0
60	Whitebeam	1.15	0	0	0	0	0	0	0
164	Oak		1	1	1	0	0	0	0

Halse grid 1, trees 41 to 60 (1996)

Tree No.	Species	Girth /m	10/01/96	17/01/96	31/01/96	14/02/96	28/02/96	13/03/96
41	Beech	3.36	0	0	0	0	0	0
42	Beech	1.55	0	0	0	0	0	0
43	Oak	1.17	0	0	0	0	0	0
44	Beech	1.22	0	0	0	0	0	0
45	Beech	1.6	0	0	0	0	0	0
46	Oak	1.13	0	0	0	0	0	0
47	Beech	2.42	0	0	0	0	0	0
48	Beech	1.3	0	0	0	0	0	0
49	Beech	1.3	0	0	0	0	0	0
50	Beech	1.1	0	0	0	0	0	0
51	Silver birch	0.59	dead	dead	dead	dead	dead	dead
52	Beech	2.47	0	0	0	0	0	0
53	Oak	1.51	0	0	0	0	0	0
54.1	Beech	2.1	0	0	0	0	0	0
54.2	Beech	0.52	0	0	0	0	0	0
55	Oak	1.99	0	0	0	0	0	0
56	Silver birch	0.87	0	0	0	0	0	0
57	Beech	2.3	0	0	0	0	0	0
58	Beech	1.52	0	0	0	0	0	0
59	Beech	1.58	0	0	0	0	0	0
60	Whitebeam	1.15	0	0	0	0	0	0
164	Oak		0	0	0	0	0	0

Tree No.	Species	Girth /m	27/03/96	03/04/96	17/04/96	01/05/96	15/05/96	22/05/96
41	Beech	3.36	0	1	1	0	1	1
42	Beech	1.55	0	1	1	1	1	0
43	Oak	1.17	0	0	0	2	2	1
44	Beech	1.22	0	0	1	0	0	0
45	Beech	1.6	0	2	1	0	1	1
46	Oak	1.13	0	0	1	2	3	3
47	Beech	2.42	0	0	0	1	0	1
48	Beech	1.3	0	1	1	0	0	0
49	Beech	1.3	0	1	1	1	1	0
50	Beech	1.1	0	0	1	0	1	1
51	Silver birch	0.59	dead	dead	dead	dead	dead	dead
52	Beech	2.47	0	2	1	1	0	0
53	Oak	1.51	0	1	2	3	3	4
54.1	Beech	2.1	0	0	1	0	1	1
54.2	Beech	0.52	0	0	0	0	0	0
55	Oak	1.99	0	1	1	2	3	2
56	Silver birch	0.87	0	1	1	0	1	0
57	Beech	2.3	0	2	1	0	2	0
58	Beech	1.52	0	0	1	0	1	0
59	Beech	1.58	0	0	1	0	1	0
60	Whitebeam	1.15	0	0	1	0	0	0
164	Oak		0	0	1	2	3	2

Tree No.	Species	Girth /m	02/06/96	24/06/96
41	Beech	3.36	0	1
42	Beech	1.55	0	1
43	Oak	1.17	1	1
44	Beech	1.22	1	1
45	Beech	1.6	1	1
46	Oak	1.13	4	2
47	Beech	2.42	0	1
48	Beech	1.3	0	0
49	Beech	1.3	0	1
50	Beech	1.1	0	1
51	Silver birch	0.59	dead	dead
52	Beech	2.47	1	1
53	Oak	1.51	4	3
54.1	Beech	2.1	0	1
54.2	Beech	0.52	0	0
55	Oak	1.99	3	3
56	Silver birch	0.87	0	0
57	Beech	2.3	0	1
58	Beech	1.52	1	1
59	Beech	1.58	0	0
60	Whitebeam	1.15	1	0
164	Oak		4	2

Halse grid 2, trees 61 to 113 (1994)

Tree No.	Species	Girth /m	23/05/94	02/06/94	16/06/94	30/06/94	14/07/94	28/07/94	12/08/94
61	Oak	2.07	3	3	4	5	4	3	3
62	Oak	1.56	2	3	2	2	2	3	3
63	Oak	1.07	1	1	1	2	3	2	3
64	Oak	2.1	/	4	3	4	4	2	1
65	Beech	0.78	1	1	1	0	2	1	1
66	Beech	0.39	3	0	1	1	1	1	1
67	Oak	1.9	/	4	4	3	5	3	3
68	Oak	1.4	3	4	3	3	3	3	3
69	Oak	1.89	3	4	3	4	4	3	3
70	Oak	1.02	2	2	2	3	2	1	0
71	Oak	1.29	3	3	3	3	3	3	3
72	Oak	1.67	3	3	3	3	3	3	2
73	Oak	1.43	2	2	2	3	2	2	0
74	Beech	1.79	1	1	2	1	1	1	1
75	Beech	0.84	1	0	1	1	0	1	2
76	Silver birch	0.1	2	1	2	1	2	0	1
77	Silver birch	0.19	2	2	2	1	2	0	0
78	Silver birch	0.06	/	/	0	1	1	0	0
79.1	Silver birch	0.8	1	1	0	1	1	0	0
79.2	Silver birch	0.24	1	1	0	1	1	1	0
80	Oak	1.46	3	3	4	3	3	3	0
81	Oak	1.28	1	1	1	2	1	3	3
82	Oak	1.15	3	3	4	3	2	3	3
83	Oak	0.95	1	1	0	1	1	1	0
84	Oak	0.91	0	0	1	1	2	2	0
85	Oak	0.98	0	0	1	0	1	1	1
86	Oak	1.15	1	1	1	1	1	2	0
87	Oak	0.92	1	1	1	1	1	1	0
88	Oak	2.21	3	3	4	3	2	3	3
89	Silver birch	0.45	/	/	1	1	1	2	0
90	Oak	1.57	3	3	3	4	3	3	3
91	Beech	1.79	1	1	2	1	2	1	0
92	Oak	1.74	3	3	3	2	2	4	3
93	Whitebeam	0.09	0	0	0	1	0	1	1
94	Whitebeam	0.55	1	1	1	1	1	0	1
95	Beech	0.04	/	/	0	1	0	0	0
96	Silver birch	0.13	/	/	0	0	0	0	0
97	Silver birch	0.14	/	/	1	1	0	0	0
98	Silver birch	0.19	/	/	0	1	1	0	0
99	Silver birch	0.17	/	/	0	0	1	0	0
100	Silver birch	0.4	2	2	1	1	1	1	0
101	Oak	4.79	3	3	5	4	4	3	4
102	Holly	0.41	1	1	0	0	1	0	0
103	Beech	1.97	1	1	1	2	1	2	2
104	Oak	0.86	1	1	1	1	0	2	0
105	Oak	1.31	4	4	5	2	3	4	3
106	Beech	1.99	1	1	3	2	2	2	3
107	Oak	0.98	2	2	1	1	2	2	1
108	Oak	1.23	3	3	3	2	2	3	3
109	Oak	1.01	4	4	3	3	3	3	3
110	Silver birch	0.15	1	1	0	0	0	0	0
111	Silver birch	0.12	0	0	0	1	0	0	0
112	Silver birch	0.13	0	0	0	0	0	1	0
113	Silver birch	0.09	0	0	0	dead	dead	dead	dead

Tree No.	Species	Girth /m	02/09/94	16/09/94	27/10/94	10/11/94	23/11/94	09/12/94
61	Oak	2.07	3	3	0	0	0	0
62	Oak	1.56	1	2	0	0	0	0
63	Oak	1.07	1	1	0	0	0	0
64	Oak	2.1	1	1	0	0	1	0
65	Beech	0.78	0	1	0	0	0	0
66	Beech	0.39	1	1	0	0	0	0
67	Oak	1.9	3	3	1	1	0	0
68	Oak	1.4	3	3	0	0	0	0
69	Oak	1.89	3	3	0	0	0	0
70	Oak	1.02	2	1	0	0	0	0
71	Oak	1.29	2	2	0	0	0	0
72	Oak	1.67	3	3	0	0	0	0
73	Oak	1.43	1	2	0	0	0	0
74	Beech	1.79	2	2	0	0	1	0
75	Beech	0.84	3	3	1	0	1	0
76	Silver birch	0.1	0	0	0	0	0	0
77	Silver birch	0.19	0	0	0	0	0	0
78	Silver birch	0.06	0	0	0	0	0	0
79.1	Silver birch	0.8	0	0	1	0	0	0
79.2	Silver birch	0.24	0	0	0	0	0	0
80	Oak	1.46	1	2	0	0	0	0
81	Oak	1.28	2	2	1	0	0	0
82	Oak	1.15	3	3	0	0	0	0
83	Oak	0.95	0	1	0	0	0	0
84	Oak	0.91	1	0	0	0	0	0
85	Oak	0.98	1	1	0	0	0	0
86	Oak	1.15	0	0	0	0	0	0
87	Oak	0.92	0	0	0	0	0	0
88	Oak	2.21	2	2	0	0	0	0
89	Silver birch	0.45	0	0	0	0	0	0
90	Oak	1.57	3	3	0	0	0	0
91	Beech	1.79	2	2	0	0	0	0
92	Oak	1.74	3	3	0	1	0	0
93	Whitebeam	0.09	0	0	0	0	0	0
94	Whitebeam	0.55	1	1	0	0	0	0
95	Beech	0.04	0	0	0	0	0	0
96	Silver birch	0.13	0	0	0	0	0	0
97	Silver birch	0.14	0	0	0	0	0	0
98	Silver birch	0.19	1	0	0	0	0	0
99	Silver birch	0.17	0	0	0	0	0	0
100	Silver birch	0.4	1	0	0	0	0	0
101	Oak	4.79	4	3	0	1	1	0
102	Holly	0.41	0	0	0	0	1	0
103	Beech	1.97	3	2	0	0	1	0
104	Oak	0.86	1	1	0	0	0	0
105	Oak	1.31	3	3	0	0	1	0
106	Beech	1.99	3	3	2	0	2	0
107	Oak	0.98	3	0	0	0	1	0
108	Oak	1.23	3	2	0	0	0	0
109	Oak	1.01	3	3	0	0	0	0
110	Silver birch	0.15	0	0	0	0	0	0
111	Silver birch	0.12	0	0	0	0	0	0
112	Silver birch	0.13	1	0	0	0	0	0
113	Silver birch	0.09	dead	dead	dead	dead	dead	dead

Halse grid 2, trees 61 to 113 (1995)

Tree No.	Species	Girth /m	04/01/95	08/02/95	08/03/95	22/03/95	07/04/95	12/04/95
61	Oak	2.07	0	0	0	0	1	2
62	Oak	1.56	0	0	0	1	1	1
63	Oak	1.07	0	0	0	0	2	1
64	Oak	2.1	0	0	0	0	3	1
65	Beech	0.78	0	0	0	0	1	1
66	Beech	0.39	0	0	0	1	1	0
67	Oak	1.9	0	0	0	1	1	3
68	Oak	1.4	0	0	0	1	2	1
69	Oak	1.89	0	0	0	1	1	1
70	Oak	1.02	0	0	0	1	3	3
71	Oak	1.29	0	0	0	1	3	3
72	Oak	1.67	0	0	0	1	2	1
73	Oak	1.43	0	0	0	1	2	1
74	Beech	1.79	0	0	0	1	2	1
75	Beech	0.84	0	0	0	1	0	0
76	Silver birch	0.1	0	0	0	1	1	0
77	Silver birch	0.19	0	0	0	2	1	2
78	Silver birch	0.06	0	0	0	0	0	0
79.1	Silver birch	0.8	0	0	0	0	1	2
79.2	Silver birch	0.24	0	0	0	0	0	1
80	Oak	1.46	0	0	0	1	3	1
81	Oak	1.28	0	0	0	1	2	2
82	Oak	1.15	0	0	0	0	3	3
83	Oak	0.95	0	0	0	0	2	1
84	Oak	0.91	0	0	0	1	1	1
85	Oak	0.98	0	0	0	1	1	1
86	Oak	1.15	0	0	0	0	1	1
87	Oak	0.92	0	0	0	0	1	0
88	Oak	2.21	0	0	0	0	3	3
89	Silver birch	0.45	0	0	0	0	0	0
90	Oak	1.57	0	0	0	1	3	3
91	Beech	1.79	0	0	0	1	2	1
92	Oak	1.74	0	0	0	1	4	3
93	Whitebeam	0.09	0	0	0	0	0	0
94	Whitebeam	0.55	0	0	0	0	2	2
95	Beech	0.04	0	0	0	0	0	0
96	Silver birch	0.13	0	0	0	0	0	0
97	Silver birch	0.14	0	0	0	0	0	0
98	Silver birch	0.19	0	0	0	0	0	0
99	Silver birch	0.17	0	0	0	0	0	0
100	Silver birch	0.4	0	0	0	0	0	0
101	Oak	4.79	0	0	0	4	4	4
102	Holly	0.41	0	0	0	1	1	0
103	Beech	1.97	0	0	0	1	2	1
104	Oak	0.86	0	0	0	1	2	2
105	Oak	1.31	0	0	0	0	3	3
106	Beech	1.99	0	0	0	2	2	2
107	Oak	0.98	0	0	0	1	2	2
108	Oak	1.23	0	0	0	1	2	3
109	Oak	1.01	0	0	0	1	3	3
110	Silver birch	0.15	0	0	0	1	0	0
111	Silver birch	0.12	0	0	0	0	0	1
112	Silver birch	0.13	0	0	0	0	0	1
113	Silver birch	0.09	dead	dead	dead	dead	dead	dead

Tree No.	Species	Girth /m	20/04/95	04/05/95	11/05/95	18/05/95	24/05/95	31/05/95
61	Oak	2.07	3	1	0	0	0	1
62	Oak	1.56	3	1	0	0	1	1
63	Oak	1.07	2	1	0	1	1	1
64	Oak	2.1	3	1	0	1	2	1
65	Beech	0.78	2	2	0	0	1	1
66	Beech	0.39	1	2	0	0	0	1
67	Oak	1.9	4	3	0	1	1	1
68	Oak	1.4	3	1	0	1	1	1
69	Oak	1.89	3	1	0	1	1	1
70	Oak	1.02	3	1	0	1	1	1
71	Oak	1.29	3	1	0	1	0	1
72	Oak	1.67	3	1	0	1	1	1
73	Oak	1.43	3	1	0	0	1	1
74	Beech	1.79	3	2	2	3	2	1
75	Beech	0.84	2	1	1	0	0	1
76	Silver birch	0.1	1	1	1	1	1	1
77	Silver birch	0.19	1	1	1	2	1	1
78	Silver birch	0.06	0	0	0	0	0	1
79.1	Silver birch	0.8	3	0	0	1	1	0
79.2	Silver birch	0.24	1	0	0	1	0	1
80	Oak	1.46	2	1	0	1	1	1
81	Oak	1.28	3	1	0	1	1	1
82	Oak	1.15	3	1	0	1	1	1
83	Oak	0.95	2	1	1	1	1	1
84	Oak	0.91	2	1	0	0	0	1
85	Oak	0.98	1	1	0	0	0	0
86	Oak	1.15	1	0	0	0	0	1
87	Oak	0.92	1	0	0	1	1	1
88	Oak	2.21	3	1	0	1	1	1
89	Silver birch	0.45	0	0	0	1	1	1
90	Oak	1.57	3	1	0	0	1	1
91	Beech	1.79	2	1	0	0	0	0
92	Oak	1.74	3	1	0	1	1	1
93	Whitebeam	0.09	1	0	0	0	0	1
94	Whitebeam	0.55	2	2	0	0	0	1
95	Beech	0.04	0	0	0	0	0	0
96	Silver birch	0.13	0	0	0	0	0	1
97	Silver birch	0.14	1	0	0	0	0	0
98	Silver birch	0.19	1	1	0	1	0	0
99	Silver birch	0.17	0	0	0	0	0	1
100	Silver birch	0.4	1	1	0	1	1	1
101	Oak	4.79	4	4	3	3	3	4
102	Holly	0.41	1	3	2	3	2	/
103	Beech	1.97	3	1	1	3	1	1
104	Oak	0.86	3	1	1	1	1	1
105	Oak	1.31	3	3	1	3	1	1
106	Beech	1.99	3	2	1	3	1	1
107	Oak	0.98	1	0	0	1	1	1
108	Oak	1.23	3	1	0	1	1	1
109	Oak	1.01	3	1	0	1	1	1
110	Silver birch	0.15	0	1	0	0	0	/
111	Silver birch	0.12	1	0	0	1	0	/
112	Silver birch	0.13	1	2	2	3	2	/
113	Silver birch	0.09	dead	dead	dead	dead	dead	dead

Tree No.	Species	Girth /m	08/06/95	13/06/95	21/06/95	28/06/95	05/07/95	12/07/95
61	Oak	2.07	1	1	0	1	1	0
62	Oak	1.56	1	1	0	0	1	0
63	Oak	1.07	1	0	0	0	1	0
64	Oak	2.1	1	1	0	1	1	1
65	Beech	0.78	1	1	0	0	1	1
66	Beech	0.39	1	1	0	0	1	0
67	Oak	1.9	1	1	0	1	3	1
68	Oak	1.4	1	1	1	1	1	1
69	Oak	1.89	1	1	0	1	1	1
70	Oak	1.02	1	1	0	1	1	1
71	Oak	1.29	1	1	0	1	1	0
72	Oak	1.67	1	1	0	2	1	1
73	Oak	1.43	1	1	0	1	1	0
74	Beech	1.79	1	2	0	1	2	2
75	Beech	0.84	1	1	0	0	1	0
76	Silver birch	0.1	2	2	0	1	1	1
77	Silver birch	0.19	2	2	0	1	2	1
78	Silver birch	0.06	0	1	0	0	1	0
79.1	Silver birch	0.8	0	1	0	1	0	0
79.2	Silver birch	0.24	0	0	0	0	0	1
80	Oak	1.46	1	1	0	1	1	1
81	Oak	1.28	1	1	0	1	1	1
82	Oak	1.15	1	1	0	1	1	1
83	Oak	0.95	1	1	0	1	1	1
84	Oak	0.91	1	0	1	0	1	1
85	Oak	0.98	1	0	1	1	0	1
86	Oak	1.15	0	0	0	1	1	0
87	Oak	0.92	0	1	0	1	1	1
88	Oak	2.21	1	1	0	1	1	1
89	Silver birch	0.45	1	0	1	0	1	0
90	Oak	1.57	1	1	0	0	1	1
91	Beech	1.79	0	0	1	0	0	1
92	Oak	1.74	1	1	1	1	1	1
93	Whitebeam	0.09	1	1	0	0	0	0
94	Whitebeam	0.55	0	1	0	1	1	0
95	Beech	0.04	1	0	0	0	0	0
96	Silver birch	0.13	0	0	0	1	0	1
97	Silver birch	0.14	0	0	0	0	0	0
98	Silver birch	0.19	1	1	0	0	1	0
99	Silver birch	0.17	0	0	0	0	0	1
100	Silver birch	0.4	1	1	0	0	1	1
101	Oak	4.79	3	3	2	1	2	1
102	Holly	0.41	1	2	0	0	0	0
103	Beech	1.97	1	1	0	0	1	1
104	Oak	0.86	1	1	0	1	1	0
105	Oak	1.31	1	1	0	1	2	1
106	Beech	1.99	1	1	0	1	1	0
107	Oak	0.98	1	1	0	0	1	1
108	Oak	1.23	1	1	0	1	1	0
109	Oak	1.01	1	0	0	1	1	1
110	Silver birch	0.15	2	2	0	2	1	1
111	Silver birch	0.12	0	0	0	0	0	0
112	Silver birch	0.13	1	1	0	1	0	0
113	Silver birch	0.09	dead	dead	dead	dead	dead	dead

Tree No.	Species	Girth /m	19/07/95	26/07/95	03/08/95	09/08/95	16/08/95	23/08/95
61	Oak	2.07	1	1	1	2	1	1
62	Oak	1.56	2	1	1	2	1	2
63	Oak	1.07	0	0	1	2	0	0
64	Oak	2.1	1	1	1	1	1	2
65	Beech	0.78	1	1	1	0	2	0
66	Beech	0.39	1	1	1	0	1	0
67	Oak	1.9	3	1	1	1	1	1
68	Oak	1.4	1	2	1	1	2	2
69	Oak	1.89	1	3	1	1	2	3
70	Oak	1.02	1	0	0	0	2	1
71	Oak	1.29	1	1	1	0	2	1
72	Oak	1.67	1	1	1	1	1	2
73	Oak	1.43	1	1	1	0	1	2
74	Beech	1.79	3	3	2	1	2	3
75	Beech	0.84	1	1	1	0	0	0
76	Silver birch	0.1	1	2	0	0	0	0
77	Silver birch	0.19	1	2	0	0	0	0
78	Silver birch	0.06	1	0	0	1	0	0
79.1	Silver birch	0.8	0	0	0	0	0	0
79.2	Silver birch	0.24	1	1	0	1	0	0
80	Oak	1.46	1	1	0	1	0	1
81	Oak	1.28	1	1	0	1	1	1
82	Oak	1.15	1	1	0	0	0	0
83	Oak	0.95	1	1	0	0	1	1
84	Oak	0.91	1	1	1	1	1	0
85	Oak	0.98	1	1	0	0	0	0
86	Oak	1.15	2	1	0	0	0	0
87	Oak	0.92	2	1	1	0	1	0
88	Oak	2.21	1	3	2	0	1	1
89	Silver birch	0.45	1	2	0	0	2	0
90	Oak	1.57	3	2	1	1	0	2
91	Beech	1.79	3	1	0	0	0	0
92	Oak	1.74	1	1	2	1	0	0
93	Whitebeam	0.09	0	1	0	0	0	0
94	Whitebeam	0.55	1	0	1	0	0	0
95	Beech	0.04	0	0	0	0	0	0
96	Silver birch	0.13	1	1	0	0	0	0
97	Silver birch	0.14	1	0	0	0	0	0
98	Silver birch	0.19	1	1	0	0	0	1
99	Silver birch	0.17	1	1	0	0	0	1
100	Silver birch	0.4	2	1	0	1	0	1
101	Oak	4.79	1	3	2	2	2	1
102	Holly	0.41	1	2	0	0	0	1
103	Beech	1.97	2	1	0	0	1	0
104	Oak	0.86	1	1	0	0	1	0
105	Oak	1.31	3	3	2	1	2	1
106	Beech	1.99	1	0	0	0	0	0
107	Oak	0.98	1	0	0	0	0	0
108	Oak	1.23	1	1	1	1	1	0
109	Oak	1.01	1	1	0	0	1	1
110	Silver birch	0.15	1	0	0	0	0	0
111	Silver birch	0.12	0	0	0	0	0	0
112	Silver birch	0.13	1	0	0	0	0	0
113	Silver birch	0.09	dead	dead	dead	dead	dead	dead

Tree No.	Species	Girth /m	30/08/95	06/09/95	13/09/95	20/09/95	27/09/95	11/10/95
61	Oak	2.07	3	3	3	3	1	1
62	Oak	1.56	1	3	1	2	1	1
63	Oak	1.07	0	0	0	0	0	0
64	Oak	2.1	1	0	0	0	0	1
65	Beech	0.78	0	0	0	0	0	0
66	Beech	0.39	0	0	0	0	0	1
67	Oak	1.9	1	0	0	0	0	1
68	Oak	1.4	2	1	0	2	1	1
69	Oak	1.89	3	3	3	3	1	1
70	Oak	1.02	0	0	0	0	0	0
71	Oak	1.29	0	0	0	0	0	0
72	Oak	1.67	1	1	2	0	2	3
73	Oak	1.43	0	0	2	1	0	0
74	Beech	1.79	2	3	2	2	1	0
75	Beech	0.84	0	0	0	0	0	0
76	Silver birch	0.1	0	0	0	0	0	0
77	Silver birch	0.19	1	0	0	0	0	0
78	Silver birch	0.06	0	0	0	0	0	0
79.1	Silver birch	0.8	0	0	0	0	0	0
79.2	Silver birch	0.24	0	0	0	0	0	0
80	Oak	1.46	1	0	0	0	0	0
81	Oak	1.28	1	0	0	0	1	0
82	Oak	1.15	0	0	0	0	0	0
83	Oak	0.95	0	0	1	0	0	0
84	Oak	0.91	1	0	3	1	0	0
85	Oak	0.98	0	0	0	0	0	0
86	Oak	1.15	0	0	0	0	0	0
87	Oak	0.92	0	0	0	0	0	0
88	Oak	2.21	0	1	0	0	0	1
89	Silver birch	0.45	0	1	0	0	0	0
90	Oak	1.57	1	1	0	1	0	0
91	Beech	1.79	0	0	0	0	0	0
92	Oak	1.74	0	0	0	0	0	0
93	Whitebeam	0.09	0	0	0	0	0	0
94	Whitebeam	0.55	0	0	0	0	0	0
95	Beech	0.04	0	0	0	0	0	0
96	Silver birch	0.13	0	0	0	0	0	0
97	Silver birch	0.14	0	0	0	0	0	0
98	Silver birch	0.19	0	1	0	0	0	1
99	Silver birch	0.17	0	1	1	1	0	0
100	Silver birch	0.4	0	0	0	0	0	0
101	Oak	4.79	1	1	3	3	3	3
102	Holly	0.41	1	2	3	2	2	2
103	Beech	1.97	1	1	0	1	0	1
104	Oak	0.86	0	0	0	0	0	0
105	Oak	1.31	1	1	0	1	1	0
106	Beech	1.99	0	0	0	0	0	0
107	Oak	0.98	0	0	0	0	0	0
108	Oak	1.23	1	0	0	1	0	0
109	Oak	1.01	0	0	0	0	0	0
110	Silver birch	0.15	0	0	0	0	0	0
111	Silver birch	0.12	0	0	0	0	0	0
112	Silver birch	0.13	0	0	0	0	0	0
113	Silver birch	0.09	dead	dead	dead	dead	dead	dead

Tree No.	Species	Girth /m	18/10/95	25/10/95	01/11/95	08/11/95	15/11/95	22/11/95	29/11/95
61	Oak	2.07	1	0	0	0	0	0	0
62	Oak	1.56	0	0	1	1	0	0	0
63	Oak	1.07	0	0	0	0	0	0	0
64	Oak	2.1	0	0	1	1	0	0	0
65	Beech	0.78	0	0	0	0	0	0	0
66	Beech	0.39	0	0	0	0	0	0	0
67	Oak	1.9	0	1	1	1	0	0	0
68	Oak	1.4	0	0	0	0	0	0	0
69	Oak	1.89	2	0	2	0	0	0	0
70	Oak	1.02	0	0	0	0	0	0	0
71	Oak	1.29	0	0	0	1	0	0	0
72	Oak	1.67	0	0	1	0	0	0	0
73	Oak	1.43	1	0	1	0	0	0	0
74	Beech	1.79	0	0	0	0	0	0	0
75	Beech	0.84	0	0	0	0	0	0	0
76	Silver birch	0.1	0	0	0	0	0	0	0
77	Silver birch	0.19	0	0	0	0	0	0	0
78	Silver birch	0.06	0	0	0	0	0	0	0
79.1	Silver birch	0.8	0	0	0	0	0	0	0
79.2	Silver birch	0.24	0	0	0	0	0	0	0
80	Oak	1.46	0	0	1	1	0	0	0
81	Oak	1.28	0	0	1	1	0	0	0
82	Oak	1.15	0	0	0	0	0	0	0
83	Oak	0.95	0	0	0	0	0	0	0
84	Oak	0.91	0	0	0	1	0	1	0
85	Oak	0.98	0	0	0	0	0	0	0
86	Oak	1.15	0	0	0	0	0	0	0
87	Oak	0.92	0	0	0	0	0	0	0
88	Oak	2.21	0	0	0	0	0	0	0
89	Silver birch	0.45	0	0	0	0	0	0	0
90	Oak	1.57	0	0	0	0	0	0	0
91	Beech	1.79	0	0	0	0	0	0	0
92	Oak	1.74	0	0	0	0	0	0	0
93	Whitebeam	0.09	0	0	0	0	0	0	0
94	Whitebeam	0.55	0	0	0	0	0	0	0
95	Beech	0.04	0	0	0	0	0	0	0
96	Silver birch	0.13	0	0	0	0	0	0	0
97	Silver birch	0.14	0	0	0	0	0	0	0
98	Silver birch	0.19	0	0	1	0	1	0	0
99	Silver birch	0.17	1	1	1	0	0	0	0
100	Silver birch	0.4	0	0	0	0	0	0	0
101	Oak	4.79	3	2	3	3	1	2	0
102	Holly	0.41	2	2	1	1	0	0	0
103	Beech	1.97	0	0	0	0	0	0	0
104	Oak	0.86	0	0	0	0	0	0	0
105	Oak	1.31	0	0	0	0	0	0	0
106	Beech	1.99	0	0	1	0	0	0	0
107	Oak	0.98	0	0	0	0	0	0	0
108	Oak	1.23	0	0	0	0	0	0	0
109	Oak	1.01	0	0	0	0	0	0	0
110	Silver birch	0.15	0	0	0	0	0	0	0
111	Silver birch	0.12	0	0	0	0	0	0	0
112	Silver birch	0.13	0	0	0	0	0	0	0
113	Silver birch	0.09	dead	dead	dead	dead	dead	dead	dead

Halse grid 2, trees 61 to 113 (1996)

Tree No.	Species	Girth /m	10/01/96	17/01/96	31/01/96	14/02/96	28/02/96	13/03/96	27/03/96
61	Oak	2.07	0	0	0	0	0	0	0
62	Oak	1.56	0	0	0	0	0	0	0
63	Oak	1.07	0	0	0	0	0	0	0
64	Oak	2.1	0	0	0	0	0	0	0
65	Beech	0.78	0	0	0	0	0	0	0
66	Beech	0.39	0	0	0	0	0	0	0
67	Oak	1.9	0	0	0	0	0	0	0
68	Oak	1.4	0	0	0	0	0	0	0
69	Oak	1.89	0	0	0	0	0	0	0
70	Oak	1.02	0	0	0	0	0	0	0
71	Oak	1.29	0	0	0	0	0	0	0
72	Oak	1.67	0	0	0	0	0	0	0
73	Oak	1.43	0	0	0	0	0	0	0
74	Beech	1.79	0	0	0	0	0	0	0
75	Beech	0.84	0	0	0	0	0	0	0
76	Silver birch	0.1	0	0	0	0	0	0	0
77	Silver birch	0.19	0	0	0	0	0	0	0
78	Silver birch	0.06	0	0	0	0	0	0	0
79.1	Silver birch	0.8	0	0	0	0	0	0	0
79.2	Silver birch	0.24	0	0	0	0	0	0	0
80	Oak	1.46	0	0	0	0	0	0	0
81	Oak	1.28	0	0	0	0	0	0	0
82	Oak	1.15	0	0	0	0	0	0	0
83	Oak	0.95	0	0	0	0	0	0	0
84	Oak	0.91	0	0	0	0	0	0	0
85	Oak	0.98	0	0	0	0	0	0	0
86	Oak	1.15	0	0	0	0	0	0	0
87	Oak	0.92	0	0	0	0	0	0	0
88	Oak	2.21	0	0	0	0	0	0	0
89	Silver birch	0.45	0	0	0	0	0	0	0
90	Oak	1.57	0	0	0	0	0	0	0
91	Beech	1.79	0	0	0	0	0	0	0
92	Oak	1.74	0	0	0	0	0	0	0
93	Whitebeam	0.09	0	0	0	0	0	0	0
94	Whitebeam	0.55	0	0	0	0	0	0	0
95	Beech	0.04	0	0	0	0	0	0	0
96	Silver birch	0.13	0	0	0	0	0	0	0
97	Silver birch	0.14	0	0	0	0	0	0	0
98	Silver birch	0.19	0	0	0	0	0	0	0
99	Silver birch	0.17	0	0	0	0	0	0	0
100	Silver birch	0.4	0	0	0	0	0	0	0
101	Oak	4.79	0	0	0	0	0	0	0
102	Holly	0.41	0	0	0	0	0	0	0
103	Beech	1.97	0	0	0	0	0	0	0
104	Oak	0.86	0	0	0	0	0	0	0
105	Oak	1.31	0	0	0	0	0	0	0
106	Beech	1.99	0	0	0	0	0	0	0
107	Oak	0.98	0	0	0	0	0	0	0
108	Oak	1.23	0	0	0	0	0	0	0
109	Oak	1.01	0	0	0	0	0	0	0
110	Silver birch	0.15	0	0	0	0	0	0	0
111	Silver birch	0.12	0	0	0	0	0	0	0
112	Silver birch	0.13	0	0	0	0	0	0	0
113	Silver birch	0.09	dead	dead	dead	dead	dead	dead	dead

Tree No.	Species	Girth /m	03/04/96	17/04/96	01/05/96	15/05/96	22/05/96	02/06/96	24/06/96
61	Oak	2.07	0	0	1	3	1	3	1
62	Oak	1.56	0	0	1	2	2	4	0
63	Oak	1.07	0	0	0	0	0	0	0
64	Oak	2.1	0	0	0	2	1	3	2
65	Beech	0.78	0	0	0	0	0	0	0
66	Beech	0.39	0	0	0	0	0	0	0
67	Oak	1.9	0	0	0	2	2	5	2
68	Oak	1.4	0	0	1	3	1	3	1
69	Oak	1.89	0	0	1	2	2	5	2
70	Oak	1.02	0	0	0	1	1	1	1
71	Oak	1.29	0	0	0	2	1	2	2
72	Oak	1.67	0	0	0	1	2	5	1
73	Oak	1.43	0	0	0	1	1	3	2
74	Beech	1.79	0	0	0	1	1	1	1
75	Beech	0.84	0	0	0	1	0	0	0
76	Silver birch	0.1	1	1	0	0	0	0	0
77	Silver birch	0.19	1	1	0	0	0	0	0
78	Silver birch	0.06	0	0	0	0	0	0	0
79.1	Silver birch	0.8	0	0	0	0	0	0	0
79.2	Silver birch	0.24	0	0	0	0	0	0	0
80	Oak	1.46	0	0	1	2	2	2	3
81	Oak	1.28	0	0	1	2	1	3	2
82	Oak	1.15	0	0	1	1	0	1	1
83	Oak	0.95	0	0	1	1	0	0	0
84	Oak	0.91	0	0	0	1	0	0	0
85	Oak	0.98	0	0	0	0	0	0	0
86	Oak	1.15	0	0	0	1	0	0	0
87	Oak	0.92	0	0	0	1	0	0	1
88	Oak	2.21	0	0	1	3	1	4	1
89	Silver birch	0.45	0	0	0	0	0	1	0
90	Oak	1.57	0	0	0	2	1	4	0
91	Beech	1.79	0	0	0	1	0	0	1
92	Oak	1.74	0	0	0	3	1	3	1
93	Whitebeam	0.09	0	0	0	0	0	1	1
94	Whitebeam	0.55	0	0	0	0	0	0	0
95	Beech	0.04	0	0	0	0	0	0	0
96	Silver birch	0.13	0	1	0	0	0	0	1
97	Silver birch	0.14	0	0	0	0	0	0	0
98	Silver birch	0.19	0	1	0	1	0	1	2
99	Silver birch	0.17	0	0	0	0	0	0	0
100	Silver birch	0.4	0	0	0	0	0	0	0
101	Oak	4.79	0	0	3	4	3	4	3
102	Holly	0.41	0	0	0	0	0	0	0
103	Beech	1.97	0	0	0	0	0	0	1
104	Oak	0.86	0	0	0	1	0	0	1
105	Oak	1.31	0	0	0	0	0	0	0
106	Beech	1.99	0	0	0	0	0	0	0
107	Oak	0.98	0	0	0	0	0	0	0
108	Oak	1.23	0	0	0	1	0	0	0
109	Oak	1.01	0	0	0	1	0	0	0
110	Silver birch	0.15	0	0	0	0	0	0	0
111	Silver birch	0.12	0	0	0	0	0	0	0
112	Silver birch	0.13	0	0	0	0	0	0	0
113	Silver birch	0.09	dead	dead	dead	dead	dead	dead	dead

Halse grid 2, trees 114 to 163 (1994)

Tree No.	Species	Girth /m	23/05/94	02/06/94	16/06/94	30/06/94	14/07/94	28/07/94	12/08/94
114	Silver birch	0.1	0	0	0	0	0	0	0
115	Silver birch	0.27	2	2	1	2	1	1	0
116	Silver birch	0.1	0	0	0	0	0	1	1
117	Silver birch	0.16	1	1	0	1	0	1	0
118	Silver birch	0.09	1	1	0	0	0	0	0
119	Silver birch	0.31	2	2	1	1	2	2	0
120	Silver birch	0.12	1	1	1	0	0	0	0
121	Silver birch	0.21	1	1	0	0	1	0	0
122	Silver birch	0.12	0	0	1	0	1	0	0
123	Silver birch	0.2	1	1	1	0	0	1	0
124	Silver birch	0.08	0	0	0	0	0	0	0
125	Silver birch	0.13	1	1	0	1	0	0	0
126	Silver birch	0.19	2	2	1	0	0	1	1
127	Silver birch	0.17	1	1	0	1	1	0	0
128	Beech	0.1	/	/	/	0	0	0	0
128	Silver birch	0.14	0	0	dead	dead	dead	dead	dead
129	Oak	0.76	2	2	0	/	2	1	0
130	Beech	1.18	1	1	1	0	0	1	1
131	Oak	0.73	0	0	0	0	1	1	0
132	Oak	1.22	3	3	5	3	4	4	3
133	Oak	0.81	2	2	2	2	3	3	1
134	Oak	0.29	/	/	2	1	1	0	0
135	Silver birch	0.72	1	1	1	1	1	1	0
136	Beech	1.78	1	1	1	2	1	1	1
137	Oak	0.63	/	/	2	3	2	3	2
138	Beech	0.03	/	/	0	0	0	0	0
139	Silver birch	0.13	/	/	0	0	0	0	0
140	Whitebeam	0.02	/	/	0	0	0	0	0
141	Whitebeam	0.06	/	/	0	0	0	0	0
142	Beech	0.11	/	/	0	1	1	0	0
143	Beech	0.03	/	/	0	0	0	0	0
144	Beech	0.1	/	/	0	0	0	0	0
145	Beech	0.05	/	/	0	0	0	0	0
146	Whitebeam	0.04	/	/	0	0	0	0	0
147	Beech	1.63	1	1	1	0	0	1	0
148.1	Whitebeam	1.16	1	1	0	0	0	0	0
148.2	Whitebeam	0.79	0	0	0	0	1	0	0
149	Oak	1.06	1	1	0	1	1	2	2
150	Oak	1.15	1	1	0	1	2	2	1
151	Oak	1.1	2	2	2	0	2	3	2
152	Oak	1.97	2	2	3	1	3	3	2
153	Oak	1.56	2	2	2	2	3	2	1
154	Oak	1.63	1	1	1	1	2	2	2
156	Silver birch	0.35	/	/	3	2	2	2	0
157	Silver birch	0.11	/	/	0	1	1	1	0
158	Silver birch	0.31	/	/	4	3	3	2	0
159	Silver birch	0.09	/	/	1	1	/	1	0
160	Oak	0.16	/	/	/	2	0	1	1
161	Beech	0.1	/	/	/	1	0	1	0
162	Beech	0.07	/	/	/	1	0	0	0
163	Oak		/	/	/	/	/	/	/

Tree No.	Species	Girth /m	02/09/94	16/09/94	27/10/94	10/11/94	23/11/94	09/12/94
114	Silver birch	0.1	1	0	0	0	0	0
115	Silver birch	0.27	1	0	0	0	0	0
116	Silver birch	0.1	1	0	0	0	0	0
117	Silver birch	0.16	1	0	0	0	0	0
118	Silver birch	0.09	1	0	0	0	0	0
119	Silver birch	0.31	0	0	0	0	0	0
120	Silver birch	0.12	0	0	0	0	0	0
121	Silver birch	0.21	0	0	0	0	0	0
122	Silver birch	0.12	0	0	0	0	0	0
123	Silver birch	0.2	0	0	0	0	0	0
124	Silver birch	0.08	0	0	0	0	0	0
125	Silver birch	0.13	0	0	0	0	0	0
126	Silver birch	0.19	1	0	0	0	0	0
127	Silver birch	0.17	0	0	0	0	0	0
128	Beech	0.1	0	0	0	0	0	0
128	Silver birch	0.14	dead	dead	dead	dead	dead	dead
129	Oak	0.76	1	0	0	0	0	0
130	Beech	1.18	0	1	0	0	0	0
131	Oak	0.73	0	1	0	0	0	0
132	Oak	1.22	3	3	2	0	1	0
133	Oak	0.81	3	2	0	0	0	0
134	Oak	0.29	0	0	0	0	0	0
135	Silver birch	0.72	0	1	0	0	0	0
136	Beech	1.78	1	1	1	0	1	0
137	Oak	0.63	2	2	1	0	0	0
138	Beech	0.03	0	0	0	0	0	0
139	Silver birch	0.13	0	0	0	0	0	0
140	Whitebeam	0.02	0	0	0	0	0	0
141	Whitebeam	0.06	0	1	1	0	0	0
142	Beech	0.11	0	0	0	0	0	0
143	Beech	0.03	0	0	0	0	0	0
144	Beech	0.1	1	0	0	0	0	0
145	Beech	0.05	0	0	0	0	0	0
146	Whitebeam	0.04	0	0	0	0	0	0
147	Beech	1.63	0	1	0	0	0	0
148.1	Whitebeam	1.16	0	0	0	0	0	0
148.2	Whitebeam	0.79	0	0	0	0	0	0
149	Oak	1.06	2	0	0	0	1	0
150	Oak	1.15	1	1	0	0	0	0
151	Oak	1.1	3	3	0	0	0	0
152	Oak	1.97	2	2	0	0	0	0
153	Oak	1.56	1	1	0	0	1	0
154	Oak	1.63	1	1	0	0	0	0
156	Silver birch	0.35	0	0	0	0	1	0
157	Silver birch	0.11	0	0	0	0	0	0
158	Silver birch	0.31	0	0	0	0	0	0
159	Silver birch	0.09	0	0	0	0	0	0
160	Oak	0.16	1	1	0	0	0	0
161	Beech	0.1	0	0	0	0	0	0
162	Beech	0.07	1	0	0	0	0	0
163	Oak		3	3	0	0	0	0

Halse grid 2, trees 114 to 163 (1995)

Tree No.	Species	Girth /m	04/01/95	08/02/95	08/03/95	22/03/95	07/04/95	12/04/95
114	Silver birch	0.1	0	0	0	0	0	0
115	Silver birch	0.27	0	0	0	1	1	0
116	Silver birch	0.1	0	0	0	0	0	0
117	Silver birch	0.16	0	0	0	0	1	0
118	Silver birch	0.09	0	0	0	0	1	0
119	Silver birch	0.31	0	0	0	1	0	1
120	Silver birch	0.12	0	0	0	0	1	0
121	Silver birch	0.21	0	0	0	0	1	1
122	Silver birch	0.12	0	0	0	0	0	0
123	Silver birch	0.2	0	0	0	0	2	1
124	Silver birch	0.08	0	0	0	0	0	0
125	Silver birch	0.13	0	0	0	1	1	2
126	Silver birch	0.19	0	0	0	1	1	2
127	Silver birch	0.17	0	0	0	1	1	1
128	Silver birch	0.14	dead	dead	dead	dead	dead	dead
128	Beech	0.1	0	0	0	1	1	1
129	Oak	0.76	0	0	0	1	1	1
130	Beech	1.18	0	0	0	0	1	1
131	Oak	0.73	0	0	0	1	2	2
132	Oak	1.22	0	0	0	2	4	2
133	Oak	0.81	0	0	0	1	2	3
134	Oak	0.29	0	0	0	1	1	0
135	Silver birch	0.72	0	0	0	1	1	0
136	Beech	1.78	0	0	0	1	2	1
137	Oak	0.63	0	0	0	1	1	1
138	Beech	0.03	0	0	0	0	0	0
139	Silver birch	0.13	0	0	0	0	1	0
140	Whitebeam	0.02	0	0	0	0	0	0
141	Whitebeam	0.06	0	0	0	0	0	0
142	Beech	0.11	0	0	0	0	1	0
143	Beech	0.03	0	0	0	0	0	0
144	Beech	0.1	0	0	0	0	1	0
145	Beech	0.05	0	0	0	0	0	0
146	Whitebeam	0.04	0	0	0	0	0	0
147	Beech	1.63	0	0	0	1	1	1
148.1	Whitebeam	1.16	0	0	0	0	1	1
148.2	Whitebeam	0.79	0	0	0	1	1	1
149	Oak	1.06	0	0	0	0	1	1
150	Oak	1.15	0	0	0	1	1	1
151	Oak	1.1	0	0	0	1	2	2
152	Oak	1.97	0	0	0	1	2	1
153	Oak	1.56	0	0	0	1	1	2
154	Oak	1.63	0	0	0	1	1	1
155								
156	Silver birch	0.35	0	0	0	1	1	0
157	Silver birch	0.11	0	0	0	0	1	0
158	Silver birch	0.31	0	0	0	2	1	0
159	Silver birch	0.09	0	0	0	0	0	0
160	Oak	0.16	0	0	0	0	1	0
161	Beech	0.1	0	0	0	1	1	1
162	Beech	0.07	0	0	0	0	2	1
163	Oak		0	0	0	1	3	3
165	Oak	0.53	/	/	/	1	1	1
166	Oak	1.43	/	/	/	1	3	2
167	Oak	1.15	/	/	/	1	3	3

Tree No.	Species	Girth /m	20/04/95	04/05/95	11/05/95	18/05/95	24/05/95	31/05/95
114	Silver birch	0.1	0	1	0	0	0	/
115	Silver birch	0.27	1	1	0	1	0	/
116	Silver birch	0.1	0	1	0	0	0	/
117	Silver birch	0.16	0	0	0	0	0	/
118	Silver birch	0.09	0	0	0	1	0	/
119	Silver birch	0.31	0	0	0	0	0	2
120	Silver birch	0.12	0	1	0	0	0	/
121	Silver birch	0.21	1	0	0	0	0	2
122	Silver birch	0.12	0	0	0	0	0	/
123	Silver birch	0.2	1	1	0	0	0	/
124	Silver birch	0.08	0	0	0	0	0	/
125	Silver birch	0.13	1	2	0	1	0	/
126	Silver birch	0.19	2	3	0	3	1	/
127	Silver birch	0.17	0	1	0	1	0	2
128	Silver birch	0.14	dead	dead	dead	dead	dead	dead
128	Beech	0.1	0	2	1	0	0	1
129	Oak	0.76	2	3	0	1	0	1
130	Beech	1.18	2	2	0	1	1	1
131	Oak	0.73	2	1	1	0	1	0
132	Oak	1.22	2	1	1	3	1	1
133	Oak	0.81	3	2	0	1	1	1
134	Oak	0.29	1	1	0	1	0	1
135	Silver birch	0.72	2	1	1	2	1	2
136	Beech	1.78	3	2	0	1	1	0
137	Oak	0.63	3	1	0	0	1	0
138	Beech	0.03	1	0	0	0	0	0
139	Silver birch	0.13	0	0	0	1	0	1
140	Whitebeam	0.02	0	0	0	1	0	0
141	Whitebeam	0.06	1	0	0	1	0	1
142	Beech	0.11	1	2	1	3	0	1
143	Beech	0.03	0	1	0	0	0	1
144	Beech	0.1	0	0	1	0	1	2
145	Beech	0.05	0	0	0	1	0	0
146	Whitebeam	0.04	1	0	0	0	1	1
147	Beech	1.63	1	2	0	0	1	1
148.1	Whitebeam	1.16	1	2	1	2	0	1
148.2	Whitebeam	0.79	0	0	0	0	0	2
149	Oak	1.06	2	1	0	0	1	1
150	Oak	1.15	2	1	0	0	1	1
151	Oak	1.1	3	0	0	1	1	1
152	Oak	1.97	3	1	0	0	1	1
153	Oak	1.56	3	1	0	1	1	1
154	Oak	1.63	2	1	0	0	1	1
155								
156	Silver birch	0.35	1	1	0	1	1	0
157	Silver birch	0.11	1	1	0	1	0	0
158	Silver birch	0.31	1	0	0	0	1	0
159	Silver birch	0.09	1	0	0	1	1	0
160	Oak	0.16	1	0	1	1	1	2
161	Beech	0.1	1	0	0	1	2	2
162	Beech	0.07	0	0	0	0	0	2
163	Oak		4	1	1	1	1	1
165	Oak	0.53	1	1	0	1	1	1
166	Oak	1.43	3	1	0	1	1	1
167	Oak	1.15	3	1	0	1	0	1

Tree No.	Species	Girth /m	08/06/95	13/06/95	21/06/95	28/06/95	05/07/95	12/07/95
114	Silver birch	0.1	0	0	0	0	1	1
115	Silver birch	0.27	1	1	1	0	2	2
116	Silver birch	0.1	0	0	0	0	0	1
117	Silver birch	0.16	1	0	0	0	0	1
118	Silver birch	0.09	1	0	0	0	0	0
119	Silver birch	0.31	1	0	0	0	1	2
120	Silver birch	0.12	0	1	0	0	0	1
121	Silver birch	0.21	1	0	0	0	1	1
122	Silver birch	0.12	1	0	0	1	0	0
123	Silver birch	0.2	1	1	0	1	1	1
124	Silver birch	0.08	0	0	0	0	1	0
125	Silver birch	0.13	0	0	0	0	0	0
126	Silver birch	0.19	1	0	0	1	1	0
127	Silver birch	0.17	1	0	0	0	1	0
128	Silver birch	0.14	dead	dead	dead	dead	dead	dead
128	Beech	0.1	0	0	0	0	0	0
129	Oak	0.76	0	0	0	1	0	1
130	Beech	1.18	1	0	0	1	1	1
131	Oak	0.73	1	1	0	0	1	1
132	Oak	1.22	1	1	0	1	2	1
133	Oak	0.81	1	1	0	1	1	0
134	Oak	0.29	1	0	0	1	1	0
135	Silver birch	0.72	3	2	0	2	1	0
136	Beech	1.78	1	1	0	0	1	1
137	Oak	0.63	1	0	0	1	0	1
138	Beech	0.03	0	0	0	0	0	0
139	Silver birch	0.13	0	0	0	0	0	1
140	Whitebeam	0.02	0	0	0	0	0	0
141	Whitebeam	0.06	1	1	0	0	0	1
142	Beech	0.11	1	0	0	0	1	0
143	Beech	0.03	1	0	0	1	0	0
144	Beech	0.1	1	1	0	0	0	1
145	Beech	0.05	0	1	0	0	0	0
146	Whitebeam	0.04	0	0	0	0	0	0
147	Beech	1.63	0	0	0	1	0	1
148.1	Whitebeam	1.16	0	0	0	0	1	2
148.2	Whitebeam	0.79	1	0	0	0	1	1
149	Oak	1.06	1	1	0	1	1	0
150	Oak	1.15	1	0	0	0	1	1
151	Oak	1.1	1	0	0	0	2	2
152	Oak	1.97	1	0	0	0	1	2
153	Oak	1.56	0	1	0	0	1	2
154	Oak	1.63	0	1	0	1	1	0
155								
156	Silver birch	0.35	1	1	0	1	1	0
157	Silver birch	0.11	1	1	0	0	0	0
158	Silver birch	0.31	1	1	0	1	0	0
159	Silver birch	0.09	1	1	0	0	1	1
160	Oak	0.16	2	2	1	0	1	0
161	Beech	0.1	1	0	0	1	1	0
162	Beech	0.07	2	0	0	0	0	0
163	Oak		1	1	0	1	0	1
165	Oak	0.53	1	1	1	1	1	1
166	Oak	1.43	1	0	0	1	1	1
167	Oak	1.15	1	1	0	1	0	2

Tree No.	Species	Girth /m	19/07/95	26/07/95	03/08/95	09/08/95	16/08/95	23/08/95
114	Silver birch	0.1	1	0	0	0	0	0
115	Silver birch	0.27	1	0	0	0	0	0
116	Silver birch	0.1	0	0	1	0	0	0
117	Silver birch	0.16	1	0	0	0	0	0
118	Silver birch	0.09	1	0	0	0	0	0
119	Silver birch	0.31	0	0	0	1	0	0
120	Silver birch	0.12	0	0	0	0	0	0
121	Silver birch	0.21	1	1	0	0	0	0
122	Silver birch	0.12	1	0	0	0	0	0
123	Silver birch	0.2	1	0	0	0	0	0
124	Silver birch	0.08	1	0	0	0	0	0
125	Silver birch	0.13	0	0	0	0	0	0
126	Silver birch	0.19	1	0	0	0	0	0
127	Silver birch	0.17	0	0	0	0	0	0
128	Silver birch	0.14	dead	dead	dead	dead	dead	dead
128	Beech	0.1	0	0	0	0	0	0
129	Oak	0.76	0	1	0	0	0	0
130	Beech	1.18	1	1	1	1	0	0
131	Oak	0.73	1	1	1	1	1	0
132	Oak	1.22	1	1	1	0	1	1
133	Oak	0.81	1	1	1	0	1	0
134	Oak	0.29	0	1	1	0	1	1
135	Silver birch	0.72	0	0	0	0	1	0
136	Beech	1.78	1	1	1	1	0	0
137	Oak	0.63	1	0	1	0	0	0
138	Beech	0.03	1	0	0	0	1	0
139	Silver birch	0.13	1	1	1	0	0	1
140	Whitebeam	0.02	0	0	0	0	0	0
141	Whitebeam	0.06	0	1	0	0	0	0
142	Beech	0.11	1	1	0	0	0	0
143	Beech	0.03	1	0	0	0	0	0
144	Beech	0.1	1	0	0	0	0	0
145	Beech	0.05	1	0	0	0	0	0
146	Whitebeam	0.04	0	0	0	0	0	0
147	Beech	1.63	1	1	0	1	1	0
148.1	Whitebeam	1.16	2	1	1	0	1	1
148.2	Whitebeam	0.79	2	1	1	1	2	3
149	Oak	1.06	1	1	0	0	1	1
150	Oak	1.15	1	1	1	0	1	1
151	Oak	1.1	1	1	1	0	1	1
152	Oak	1.97	1	1	1	1	1	1
153	Oak	1.56	1	1	1	0	0	0
154	Oak	1.63	1	1	1	0	1	1
155								
156	Silver birch	0.35	1	1	0	0	0	0
157	Silver birch	0.11	1	1	0	0	0	0
158	Silver birch	0.31	1	1	0	0	0	0
159	Silver birch	0.09	1	1	0	0	0	0
160	Oak	0.16	0	1	0	0	0	0
161	Beech	0.1	0	1	0	0	0	0
162	Beech	0.07	0	0	0	0	0	0
163	Oak		2	1	1	0	1	0
165	Oak	0.53	1	1	1	0	1	0
166	Oak	1.43	1	1	1	1	0	0
167	Oak	1.15	2	3	1	1	1	1

Tree No.	Species	Girth /m	30/08/95	06/09/95	13/09/95	20/09/95	27/09/95	11/10/95
114	Silver birch	0.1	0	0	0	0	0	0
115	Silver birch	0.27	0	0	0	0	0	0
116	Silver birch	0.1	0	1	0	0	0	0
117	Silver birch	0.16	0	0	0	0	0	0
118	Silver birch	0.09	0	0	0	0	0	0
119	Silver birch	0.31	0	0	0	0	0	0
120	Silver birch	0.12	0	0	0	0	0	0
121	Silver birch	0.21	0	0	0	0	0	0
122	Silver birch	0.12	0	0	0	0	0	0
123	Silver birch	0.2	0	0	0	0	0	0
124	Silver birch	0.08	0	1	0	0	0	0
125	Silver birch	0.13	0	0	0	0	0	0
126	Silver birch	0.19	0	0	0	0	0	0
127	Silver birch	0.17	0	0	0	0	0	0
128	Silver birch	0.14	dead	dead	dead	dead	dead	dead
128	Beech	0.1	0	0	0	0	0	0
129	Oak	0.76	1	0	0	0	0	0
130	Beech	1.18	0	0	0	0	0	0
131	Oak	0.73	0	1	0	0	0	0
132	Oak	1.22	1	1	1	0	1	3
133	Oak	0.81	1	1	0	0	0	0
134	Oak	0.29	0	0	0	0	0	0
135	Silver birch	0.72	0	0	0	0	0	0
136	Beech	1.78	1	0	0	0	0	0
137	Oak	0.63	0	0	0	0	0	0
138	Beech	0.03	0	0	0	0	0	0
139	Silver birch	0.13	0	0	0	0	0	0
140	Whitebeam	0.02	0	0	0	0	0	0
141	Whitebeam	0.06	0	0	0	0	0	0
142	Beech	0.11	0	0	0	0	0	0
143	Beech	0.03	0	0	0	0	0	0
144	Beech	0.1	0	1	0	0	0	0
145	Beech	0.05	1	0	0	0	0	0
146	Whitebeam	0.04	0	0	0	0	0	0
147	Beech	1.63	0	0	0	1	1	0
148.1	Whitebeam	1.16	1	0	0	0	1	0
148.2	Whitebeam	0.79	2	3	2	2	2	3
149	Oak	1.06	0	0	0	0	0	0
150	Oak	1.15	1	1	0	0	0	0
151	Oak	1.1	1	0	1	0	0	0
152	Oak	1.97	2	1	0	1	1	0
153	Oak	1.56	1	0	0	0	0	0
154	Oak	1.63	1	0	1	0	0	0
155								
156	Silver birch	0.35	0	0	0	0	0	0
157	Silver birch	0.11	0	0	0	0	0	0
158	Silver birch	0.31	0	0	0	0	0	0
159	Silver birch	0.09	0	0	0	0	0	0
160	Oak	0.16	0	0	1	0	1	0
161	Beech	0.1	0	1	1	1	1	0
162	Beech	0.07	0	0	0	0	1	0
163	Oak		1	0	0	0	0	0
165	Oak	0.53	0	0	0	0	0	0
166	Oak	1.43	1	0	0	0	2	0
167	Oak	1.15	1	0	0	0	0	0

Tree No.	Species	Girth /m	18/10/95	25/10/95	01/11/95	08/11/95	15/11/95	22/11/95	29/11/95
114	Silver birch	0.1	0	0	0	0	0	0	0
115	Silver birch	0.27	0	0	0	0	0	0	0
116	Silver birch	0.1	0	0	0	0	0	0	0
117	Silver birch	0.16	0	0	0	0	0	0	0
118	Silver birch	0.09	0	0	0	0	0	0	0
119	Silver birch	0.31	0	0	0	0	0	0	0
120	Silver birch	0.12	0	0	0	0	0	0	0
121	Silver birch	0.21	0	0	0	0	0	0	0
122	Silver birch	0.12	0	0	0	0	0	0	0
123	Silver birch	0.2	0	0	0	0	0	0	0
124	Silver birch	0.08	0	1	0	0	0	0	0
125	Silver birch	0.13	0	0	0	0	0	0	0
126	Silver birch	0.19	0	0	0	0	0	0	0
127	Silver birch	0.17	0	0	0	0	0	0	0
128	Silver birch	0.14	dead	dead	dead	dead	dead	dead	dead
128	Beech	0.1	0	0	0	0	0	0	0
129	Oak	0.76	0	0	0	0	0	0	0
130	Beech	1.18	0	0	0	0	0	0	0
131	Oak	0.73	0	0	0	0	0	0	0
132	Oak	1.22	1	3	3	3	1	1	0
133	Oak	0.81	0	0	0	0	0	0	0
134	Oak	0.29	0	0	0	0	0	0	0
135	Silver birch	0.72	0	0	0	0	0	0	0
136	Beech	1.78	0	0	0	0	0	0	0
137	Oak	0.63	0	0	0	0	0	0	0
138	Beech	0.03	0	0	0	0	0	0	0
139	Silver birch	0.13	0	0	0	0	0	0	0
140	Whitebeam	0.02	0	0	0	0	0	0	0
141	Whitebeam	0.06	0	0	0	0	0	0	0
142	Beech	0.11	0	0	0	0	0	0	0
143	Beech	0.03	0	0	0	0	0	0	0
144	Beech	0.1	1	0	0	0	0	0	0
145	Beech	0.05	0	0	0	0	0	0	0
146	Whitebeam	0.04	0	0	0	0	0	0	0
147	Beech	1.63	0	0	0	0	0	0	0
148.1	Whitebeam	1.16	0	0	0	0	0	0	0
148.2	Whitebeam	0.79	2	1	2	1	1	0	0
149	Oak	1.06	0	0	0	0	0	0	0
150	Oak	1.15	0	0	0	0	0	0	0
151	Oak	1.1	0	0	0	0	0	0	0
152	Oak	1.97	0	0	1	0	0	0	0
153	Oak	1.56	0	0	0	0	0	0	0
154	Oak	1.63	0	0	0	0	0	0	0
155									
156	Silver birch	0.35	0	0	0	0	0	0	0
157	Silver birch	0.11	0	0	0	0	0	0	0
158	Silver birch	0.31	0	0	0	0	0	0	0
159	Silver birch	0.09	0	0	0	0	0	0	0
160	Oak	0.16	1	0	0	0	0	0	0
161	Beech	0.1	0	0	0	0	0	0	0
162	Beech	0.07	0	0	0	0	0	0	0
163	Oak		0	0	0	1	0	0	0
165	Oak	0.53	0	0	1	0	0	0	0
166	Oak	1.43	1	1	0	2	1	0	0
167	Oak	1.15	0	0	0	0	0	0	0

Halse grid 2, trees 114 to 163 (1996)

Tree No.	Species	Girth /m	10/01/96	17/01/96	31/01/96	14/02/96	28/02/96	13/03/96	27/03/96
114	Silver birch	0.1	0	0	0	0	0	0	0
115	Silver birch	0.27	0	0	0	0	0	0	0
116	Silver birch	0.1	0	0	0	0	0	0	0
117	Silver birch	0.16	0	0	0	0	0	0	0
118	Silver birch	0.09	0	0	0	0	0	0	0
119	Silver birch	0.31	0	0	0	0	0	0	0
120	Silver birch	0.12	0	0	0	0	0	0	0
121	Silver birch	0.21	0	0	0	0	0	0	0
122	Silver birch	0.12	0	0	0	0	0	0	0
123	Silver birch	0.2	0	0	0	0	0	0	0
124	Silver birch	0.08	0	0	0	0	0	0	0
125	Silver birch	0.13	0	0	0	0	0	0	0
126	Silver birch	0.19	0	0	0	0	0	0	0
127	Silver birch	0.17	0	0	0	0	0	0	0
128	Silver birch	0.14	dead	dead	dead	dead	dead	dead	dead
128	Beech	0.1	0	0	0	0	0	0	0
129	Oak	0.76	0	0	0	0	0	0	0
130	Beech	1.18	0	0	0	0	0	0	0
131	Oak	0.73	0	0	0	0	0	0	0
132	Oak	1.22	0	0	0	0	0	0	0
133	Oak	0.81	0	0	0	0	0	0	0
134	Oak	0.29	0	0	0	0	0	0	0
135	Silver birch	0.72	0	0	0	0	0	0	0
136	Beech	1.78	0	0	0	0	0	0	0
137	Oak	0.63	0	0	0	0	0	0	0
138	Beech	0.03	0	0	0	0	0	0	0
139	Silver birch	0.13	0	0	0	0	0	0	0
140	Whitebeam	0.02	0	0	0	0	0	0	0
141	Whitebeam	0.06	0	0	0	0	0	0	0
142	Beech	0.11	0	0	0	0	0	0	0
143	Beech	0.03	0	0	0	0	0	0	0
144	Beech	0.1	0	0	0	0	0	0	0
145	Beech	0.05	0	0	0	0	0	0	0
146	Whitebeam	0.04	0	0	0	0	0	0	0
147	Beech	1.63	0	0	0	0	0	0	0
148.1	Whitebeam	1.16	0	0	0	0	0	0	0
148.2	Whitebeam	0.79	0	0	0	0	0	0	0
149	Oak	1.06	0	0	0	0	0	0	0
150	Oak	1.15	0	0	0	0	0	0	0
151	Oak	1.1	0	0	0	0	0	0	0
152	Oak	1.97	0	0	0	0	0	0	0
153	Oak	1.56	0	0	0	0	0	0	0
154	Oak	1.63	0	0	0	0	0	0	0
155									
156	Silver birch	0.35	0	0	0	0	0	0	0
157	Silver birch	0.11	0	0	0	0	0	0	0
158	Silver birch	0.31	0	0	0	0	0	0	0
159	Silver birch	0.09	0	0	0	0	0	0	0
160	Oak	0.16	0	0	0	0	0	0	0
161	Beech	0.1	0	0	0	0	0	0	0
162	Beech	0.07	0	0	0	0	0	0	0
163	Oak		0	0	0	0	0	0	0
165	Oak	0.53	0	0	0	0	0	0	0
166	Oak	1.43	0	0	0	0	0	0	0
167	Oak	1.15	0	0	0	0	0	0	0

Tree No.	Species	Girth /m	03/04/96	17/04/96	01/05/96	15/05/96	22/05/96	02/06/96	24/06/96
114	Silver birch	0.1	0	0	0	0	0	0	0
115	Silver birch	0.27	0	0	0	0	0	0	0
116	Silver birch	0.1	0	0	0	0	0	0	0
117	Silver birch	0.16	0	0	0	0	0	0	0
118	Silver birch	0.09	0	1	0	0	0	1	0
119	Silver birch	0.31	0	0	0	1	0	0	0
120	Silver birch	0.12	0	0	0	0	0	0	0
121	Silver birch	0.21	0	0	0	0	0	0	0
122	Silver birch	0.12	0	0	0	0	0	0	0
123	Silver birch	0.2	0	0	0	0	0	0	0
124	Silver birch	0.08	0	1	0	0	0	0	0
125	Silver birch	0.13	0	0	0	1	0	0	0
126	Silver birch	0.19	0	0	0	0	0	0	0
127	Silver birch	0.17	0	0	0	0	0	0	0
128	Silver birch	0.14	dead	dead	dead	dead	dead	dead	dead
128	Beech	0.1	0		0	0	0	0	0
129	Oak	0.76	0	0	0	0	0	0	0
130	Beech	1.18	0	0	0	0	0	0	0
131	Oak	0.73	0	0	0	1	0	0	0
132	Oak	1.22	0	0	2	1	0	3	0
133	Oak	0.81	0	0	1	1	1	0	0
134	Oak	0.29	0	0	0	0	0	0	0
135	Silver birch	0.72	0	0	0	0	0	1	0
136	Beech	1.78	0	0	1	0	0	2	0
137	Oak	0.63	0	0	0	0	0	0	0
138	Beech	0.03	0	0	0	0	0	0	0
139	Silver birch	0.13	0	0	0	0	0	0	0
140	Whitebeam	0.02	0	0	0	0	0	0	0
141	Whitebeam	0.06	0	0	0	0	0	1	0
142	Beech	0.11	0	0	0	0	0	0	0
143	Beech	0.03	0	0	0	0	0	0	0
144	Beech	0.1	0	0	1	0	0	0	0
145	Beech	0.05	0	0	0	0	0	0	0
146	Whitebeam	0.04	0	0	0	0	0	0	0
147	Beech	1.63	0	0	0	1	0	0	0
148.1	Whitebeam	1.16	0	0	0	0	0	2	0
148.2	Whitebeam	0.79	0	0	0	1	0	2	0
149	Oak	1.06	0	0	0	2	0	2	0
150	Oak	1.15	0	0	0	0	0	0	0
151	Oak	1.1	0	0	0	0	0	1	1
152	Oak	1.97	0	0	0	1	1	0	1
153	Oak	1.56	0	0	0	0	0	0	1
154	Oak	1.63	0	0	0	0	0	0	0
155									
156	Silver birch	0.35	0	0	0	0	0	0	0
157	Silver birch	0.11	0	0	0	1	0	0	0
158	Silver birch	0.31	0	0	0	1	0	0	0
159	Silver birch	0.09	0	1	0	0	0	0	0
160	Oak	0.16	0	0	0	0	0	1	0
161	Beech	0.1	0	1	0	0	0	0	0
162	Beech	0.07	0	0	0	0	0	0	0
163	Oak		0	0	0	3	1	4	0
165	Oak	0.53	0	0	0	1	0	1	0
166	Oak	1.43	0	0	1	3	2	3	1
167	Oak	1.15	0	0	0	1	0	1	1

Appendix E: Quadrat counts for Halse grids 1 and 2

Halse 1

30/08/95	1	1	1	4	0
	0	3	0	3	0
	0	5	4	0	5
	1	8	11	2	2
	4	18	23	35	3
	0	400+ (nest)	5	4	0
	1	15	4	1	5
	19	6	2	2	4
27/09/95	0	0	0	3	0
	0	0	1	0	0
	0	1	1	0	0
	1	2	0	1	2
	1	7	3	18	6
	1	120+ (nest)	2	0	0
	0	4	5	0	1
	7	1	0	1	2
29/11/95	0	0	0	1	0
	0	0	0	1	0
	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0
	1	4 (nest)	0	0	0
	0	0	0	0	0
	0	0	0	0	0
31/01/96	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0
	0	0 (nest)	0	0	0
	0	0	0	0	0
	0	0	0	0	0
03/04/96	0	0	0	0	0
	0	0	1	0	0
	0	0	0	0	0
	1	1	2	0	0
	0	13	7	0	0
	1	2250 (nest)	2	0	0
	0	3	1	4	0
	0	0	1	0	0
22/05/96	26	0	0	0	0
	0	0	1	0	0
	0	0	1	5	7
	1	4	1	12	22
	1	0	25	20	7
	0	300 (nest)	0	0	0
	0	3	14	0	1
	2	3	11	0	1
24/06/96	25	3	3	4	5
	20	9	2	5	6
	4	15	5	6	5
	9	17	4	5	4
	7	8	9	14	15
	11	500 (nest)	11	5	5
	15	15	23	17	8
	20	9	25	6	4

Halse 2

30/08/95	2	0	0	1	0
	0	1	1	1	11
	3	4	0	1	2
	0	2	3	3	1
	23	32	9	4	1
	21	300+ (nest)	8	4	1
	7	6	6	22	5
	2	4	0	3	2
27/09/95	0	0	1	0	0
	2	1	7	6	0
	4	3	2	2	10
	0	2	4	0	1
	21	17	3	0	1
	11	100+ (nest)	1	0	0
	5	1	2	1	0
	5	2	1	0	0
29/11/95	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0
	0	1	0	0	0
	0	20 (nest)	0	0	0
	0	0	0	0	0
	0	1	0	5	0
31/01/96	0	0	0	0	0
	0	0	0	0	0
	0	0	0	0	0
	0	1 (nest)	0	0	0
	0	0	0	0	0
	0	0	0	0	0
03/04/96	0	0	0	0	0
	0	1	0	0	0
	0	0	0	0	0
	0	2	0	0	0
	0	9	1	0	0
	0	1000 (nest)	0	0	0
	0	0	0	0	0
	0	0	0	0	0
22/05/96	1	0	1	0	0
	0	0	1	12	1
	0	2	0	3	1
	0	5	0	0	0
	25	4	2	0	0
	0	300 (nest)	0	0	0
	8	1	0	0	0
	9	0	0	3	0
24/06/96	2	12	13	5	4
	11	10	6	12	7
	4	6	12	3	7
	7	40	9	5	1
	25	20	6	1	2
	35	500 (nest)	13	5	5
	28	13	19	3	9
	9	5	9	4	4

Appendix F: Foraging counts for Dimsdale (whole site) for 1994 to 1996

Dimsdale, trees outside grids 1 and 2

Tree No	Species	Girth	08/94	07/09/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
1	Beech	3.61	1	1	0	1	1	0	0	0	1
2	Oak	0.74	0	0	0	1	1	0	0	0	1
3	Beech	1.5	1	1	1	1	3	0	0	1	1
4	Oak	1.13	3	2	1	1	1	1	0	0	1
5	Oak	1.12	3	2	2	2	1	2	0	1	2
6	Oak	0.75	2	2	2	2	1	1	0	1	1
7	Oak	0.69	0	2	1	2	1	1	0	0	1
8	Oak	0.65	1	0	0	1	1	0	0	0	1
8.1	Oak	0.67	/	0	/	/	/	0	0	0	1
9.01	Oak	0.64	0	0	0	1	1	0	0	1	1
9.02	Oak	0.83	1	1	1	2	1	1	0	1	2
10	Beech	1.62	1	0	1	1	1	0	0	1	1
11	Beech	1.39	0	0	0	1	3	0	0	0	1
12.01	Beech	1.03	1	0	1	1	1	0	0	0	1
12.02	Beech	0.74	0	0	0	1	1	0	0	0	0
13	Oak	0.79	1	1	1	2	1	0	0	0	1
14	Beech	3.01	0	0	1	1	3	0	0	0	1
15	Oak	1	2	1	1	1	1	1	0	0	1
16	Beech	0.53	1	1	1	1	1	1	0	0	1
17	Whitebeam	0.12	0	0	0	0	1	1	0	0	0
18	Oak	0.79	1	1	1	1	1	0	1	0	1
19	Oak	1.2	1	1	1	2	1	0	0	1	1
20.01	Beech	0 33	1	0	1	1	3	0	0	1	1
20.02	Beech	0.29	1	0	1	1	2	0	0	1	1
21	Beech	1.72	1	1	1	2	3	1	0	0	1
22	Beech	0.72	1	0	0	1	1	0	0	0	0
23	Oak	0.79	1	1	1	2	1	0	0	0	0
24	Beech	1.22	1	1	1	1	2	0	0	0	1
25	Holly	0.22	1	0	0	1	1	0	0	0	0
26	Oak	1.22	3	1	0	1	2	0	0	0	2
27	Beech	1 68	1	0	0	2	3	0	0	1	1
28	Oak	0.94	2	2	1	1	3	1	0	1	1
29	Oak	0.97	3	2	1	2	1	1	0	0	2
30	Beech	0.93	1	0	0	1	1	0	0	1	1
31	Oak	1.24	3	1	1	1	1	1	0	1	2
32	Beech	1.17	1	0	0	1	2	0	0	0	1
33.01	Beech	1.11	1	0	0	1	1	0	0	0	1
33.02	Beech	0.8	0	0	0	1	1	0	0	0	0
34.01	Beech	0.5	0	0	0	0	1	0	0	0	1
34.02	Beech	0.67	0	0	0	1	1	0	0	0	0
35	Oak	1.149	2	1	1	3	3	2	0	1	1
36	Oak	1.17	3	2	1	2	2	2	0	1	1
37	Beech	1.6	0	0	1	1	/	0	0	1	0
38	Oak	0.99	2	1	1	1	1	0	0	0	1
39	Oak	1.08	0	0	1	1	1	0	0	0	0
40	Oak	1.19	3	2	1	1	3	1	0	1	1
41	Beech	1.7	1	0	1	1	1	1	0	1	1
42	Holly	0.19	0	0	1	0	1	0	0	0	0
43	Oak	1.2	2	1	1	1	1	0	0	0	0
44	Oak	0.3	0	0	1	0	1	0	0	0	1
45	Oak	1.08	3	2	1	1	1	1	0	0	2
46	Oak	0.91	/	1	1	1	1	0	0	1	1
47	Oak	1.4	3	2	1	1	1	1	0	0	2
48	Oak	0.86	3	1	1	1	1	0	0	0	1
49	Oak	1.14	3	1	1	1	1	0	0	0	1
50	Oak	1.2	3	2	2	2	1	1	0	1	2
51	Holly	0.45	0	0	0	1	1	0	0	1	0
52	Oak	1.58	1	2	1	1	1	0	0	1	1
53	Oak	1.04	3	3	2	2	1	1	0	1	1
54	Oak	1.13	4	4	3	3	1	1	0	1	2
55	Beech	0.39	1	0	1	1	1	0	0	0	1
56	Holly	0.23	1	0	1	1	1	0	0	0	0

Tree No.	Species	Girth	08/94	07/09/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
57	Beech	1.94	2	0	1	0	3	1	0	1	0
58	Beech	1.2	1	1	1	1	2	1	1	1	1
59	Beech	0.98	0	0	1	1	2	0	0	0	0
60	Oak	1.09	3	2	2	3	2	0	1	0	3
61	Group	0.334	1	1	1	1	1	0	0	1	2
62	Beech	1.83	2	0	1	1	3	1	1	0	1
63	Oak	0.53	0	0	1	1	1	0	1	0	1
64	Oak	1.24	2	2	1	2	1	2	1	1	2
65	Beech	1.93	1	0	1	1	2	0	0	1	1
66	Oak	0.94	0	0	1	1	1	0	0	1	1
67	Oak	1.35	3	1	1	1	1	0	0	0	1
68	Beech	1.58	2	0	1	1	1	0	0	1	1
69	Oak	0.8	1	0	1	1	2	1	0	0	1
70	Oak	0.98	2	1	1	1	1	1	0	0	1
71	Oak	0.94	2	1	1	1	3	1	0	0	0
72.01	Beech	1.52	1	0	1	1	3	1	1	0	1
72.02	Beech	0.85	0	0	1	1	2	1	0	0	0
73	Oak	1.33	1	0	0	0	3	2	0	0	0
74	Beech	0.91	1	0	0	0	1	0	0	0	0
75	Oak	0 9	1	0	1	0	1	1	0	1	1
76	Oak	0.85	1	1	1	1	2	2	0	0	1
77	Beech	1.77	1	0	1	0	1	0	0	1	0
78	Oak	0 84	0	1	1	0	1	1	0	0	1
79	Oak	1.11	0	0	0	1	1	1	0	0	1
80	Beech	1.29	0	0	1	1	1	0	0	1	1
81	Oak	1.28	3	2	1	1	2	1	0	0	2
82	Beech	1.98	1	1	1	0	2	0	1	1	1
83	Oak	0.54	0	1	0	1	1	0	1	1	1
84	Oak	0.89	0	0	1	1	1	0	0	0	1
85	Duplicate of 63										
86	Duplicate of 62										
87	Oak	1.77	4	4	3	3	2	3	0	1	3
88	Oak	1.76	4	3	3	2	3	3	0	1	3
89	Beech	1.34	1	1	1	1	2	0	0	1	1
90	Beech	1.48	1	0	1	0	2	0	0	1	0
91	Beech	1.17	0	1	1	1	1	0	0	1	1
92	Beech	0.92	1	0	1	0	1	0	0	0	0
93.01	Beech	2.43	0	0	1	1	1	0	0	0	1
93.02	Beech	1.08	0	0	1	0	1	0	0	1	1
94	Group	0.348	0	1	0	1	1	0	0	1	1
95	Oak	1.85	4	4	3	4	3	2	1	2	4
96	Oak	1.65	4	3	2	3	3	3	1	0	4
97	Oak	1.1	3	3	2	1	1	1	0	0	2
98	Oak	0.78	2	1	1	1	1	1	0	0	2
99	Oak	1.13	4	3	2	1	1	3	0	0	2
100	Oak	1.27	4	3	1	1	2	3	0	0	2
101	Oak	1.27	3	3	2	2	1	2	0	0	2
102	Oak	1.35	4	3	2	1	2	3	0	0	2
103	Beech	3.61	1	1	1	1	4	1	0	1	1
104	Beech	0.9	1	0	1	2	3	0	0	0	0
105	Oak	1.34	4	3	3	3	2	0	0	0	3
106	Beech	0.92	1	1	1	1	1	0	0	0	1
107	Oak	1.63	4	3	2	2	1	2	0	1	3
108	Oak	0.83	3	2	1	1	1	0	0	0	1
109	Oak	1.23	3	2	1	1	1	0	0	1	1
110	Beech	1.51	1	1	1	1	3	1	0	0	1
111	Beech	0.49	0	0	1	0	1	0	0	0	0
112	Beech	1.17	1	1	1	1	3	1	0	0	1
113	Beech	1.11	1	0	1	1	1	0	0	0	0
114	Beech	1.44	1	1	1	1	2	1	0	0	2
115	Beech	1.05	1	1	0	1	1	0	0	1	1
116	Beech	0.93	2	0	0	1	2	0	0	1	1
117	Beech	1.71	2	1	1	2	4	1	0	0	1
118	Beech	1.05	2	0	1	2	3	0	0	0	0
119	Beech	1.67	1	2	1	2	3	1	1	0	1
120	Beech	3.58	1	0	0	1	/	1	0	0	1
121	Oak	3.45	1	1	1	2	3	2	0	1	4

Tree No.	Species	Girth	08/94	07/09/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
122	Oak	1.2	4	4	1	3	3	3	1	1	3
123	Oak	1.05	2	1	2	2	2	1	0	1	2
124	Oak	1.14	2	1	1	2	2	1	0	1	2
125	Oak	1.86	4	3	1	2	2	1	0	0	3
125.1	Oak	0.66	1	1	/	1	1	0	0	0	2
126	Oak	no data									
127	Oak	1.4	4	3	2	2	2	3	0	0	2
128.01	Beech	1.03	1	2	0	1	2	2	0	0	1
128.02	Beech	0.55	1	0	1	1	2	1	0	0	0
129	Beech	1.44	1	1	1	1	3	2	0	1	1
130	Beech	0.43	1	0	0	0	1	0	0	0	1
131	Beech	1.35	1	1	0	1	3	1	0	0	2
132.01	Beech	1.45	1	0	1	0	3	3	1	0	2
132.02	Beech	0.77	1	0	0	0	1	1	0	0	1
133	Oak	0.98	3	2	2	2	1	2	0	0	2
134	Oak	1.11	2	1	2	1	1	2	0	0	2
135	Beech	0.64	1	0	0	0	1	0	0	0	0
136.01	Beech	1.35	1	1	1	1	2	1	0	0	1
136.02	Beech	1.41	1	0	2	1	1	0	0	0	1
137	Oak	1.19	4	3	3	3	1	3	0	0	2
138	Oak	1.34	3	3	2	2	2	2	0	0	4
139	Oak	1.66	4	4	3	3	3	3	1	1	4
140	Beech	1.12	1	1	1	1	2	0	0	0	0
141	Beech	1.17	1	2	1	0	3	1	0	1	0
142	Beech	1.65	2	1	0	1	2	2	1	1	1
143	Oak	2.46	4	4	4	3	2	4	1	1	4
144	Oak	1.33	3	3	4	3	1	3	0	0	2
145	Oak	1.25	3	3	4	3	1	3	0	0	2
146	Oak	1.1	3	3	4	2	2	3	0	1	2
147	Oak	1.24	2	3	4	2	1	2	0	0	3
148	Oak	1.05	2	2	2	2	2	3	0	0	2
149.01	Oak	0.93	/	2	1	3	2	1	0	0	2
149.02	Oak	0.93	/	1	1	2	2	0	1	0	2
150	Beech	1.38	1	1	1	1	3	1	0	0	1
151	Oak	0.56	0	1	1	1	1	1	0	0	1
152.01	Beech	1.33	0	1	1	2	2	2	0	0	1
152.02	Beech	0.9	0	1	1	1	2	1	0	0	0
153	Oak	2.15	4	3	3	3	3	3	0	/	3
154	Group	0.57	1	1	1	1	1	1	0	1	1
155	Oak	1.79	3	3	2	3	3	3	0	0	4
156	Oak	1.27	3	2	2	2	2	3	0	0	3
157	Beech	1.83	1	0	0	0	2	1	0	0	1
158	Beech	1.61	0	0	0	0	2	0	0	0	1
159	Beech	1.32	1	1	1	0	2	0	0	0	1
160	Beech	1.46	2	2	1	0	3	3	0	0	2
161	Beech	1.7	2	2	1	1	3	2	1	1	3
162	Oak	0.34	/	1	0	0	1	0	0	0	1
163	Beech	1.73	2	2	3	3	3	2	1	1	3
164	Oak	1.52	3	3	4	3	1	3	0	0	3
165.01	Oak	1.2	3	3	3	2	3	3	2	0	4
165.02	Oak	1.13	3	3	3	2	3	2	2	0	3
166	Oak	1.14	2	3	3	2	1	3	1	1	4
167	Oak	1.72	3	3	3	3	3	3	3	2	4
168	Oak	1.61	4	4	3	3	2	3	2	1	2
169	Oak	1.07	2	2	3	2	1	2	0	1	3
170	Oak	0.78	1	1	2	2	0	0	0	0	1
171	Oak	1.71	3	3	3	2	4	4	1	1	3
172	Oak	1.09	3	3	3	3	2	3	1	0	3
173	Beech	0.79	1	0	2	0	1	1	0	0	1
174	Oak	1.67	3	3	3	1	2	2	0	0	3
175	Oak	1.21	2	2	2	1	2	2	0	0	3
176.01	Beech	0.98	1	0	1	1	1	1	0	0	1
176.02	Beech	0.7	1	0	1	1	1	0	1	1	0
177	Beech	1.26	1	0	1	1	1	2	1	0	1
178	Beech	1.06	1	0	1	1	2	1	0	0	1
179	Oak	1.4	2	1	1	2	1	1	0	0	2
180	Beech	0.78	0	0	1	1	1	0	0	0	0

Tree No.	Species	Girth	08/94	07/09/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
181	Oak	1.28	3	3	1	1	1	2	0	0	2
182	Oak	0.75	2	1	1	1	1	1	1	0	1
183	Oak	1.32	3	3	2	1	3	2	0	1	2
184	Beech	0.86	0	0	0	0	1	0	0	0	0
185	Beech	0.98	0	0	0	0	1	1	0	0	0
186	Beech	1.08	1	0	1	0	2	1	0	0	0
187	Beech	1.06	1	0	1	1	1	0	0	1	1
188	Oak	1.57	3	3	2	2	4	3	0	1	3
189	Beech	1.02	1	0	1	1	1	0	0	0	1
190	Oak	1.34	1	1	1	1	1	1	0	0	1
191	Beech	1.06	1	0	0	1	2	0	0	1	0
192	Beech	1.42	1	0	1	1	1	0	0	1	0
193	Beech	0.95	0	0	0	1	1	0	0	0	0
194.01	Beech	1.77	0	1	1	0	2	0	0	1	1
194.02	Beech	1.73	0	1	1	0	1	1	0	1	0
195	Beech	1.26	1	0	1	1	1	0	0	0	1
196	Beech	1.13	0	0	1	1	1	0	0	0	1
197	Beech	3.97	2	1	1	0	3	1	0	1	2
198	Oak	1.32	3	2	2	2	2	3	0	0	4
199	Oak	0.79	0	0	0	1	0	1	0	0	2
200	Beech	2.74	1	0	1	1	2	0	0	0	2
200.1	Oak	0.48	/	/	1	2	2	2	2	0	1
201	Oak	1.2	3	3	1	2	2	1	0	0	4
202	Silver birch	0.88	2	0	1	0	1	1	0	2	0
203.01	Beech	0.87	0	0	0	0	1	1	0	0	1
203.02	Beech	0.82	1	0	0	0	0	0	0	0	1
203 03	Beech	0.76	0	0	0	0	1	0	0	0	1
204	Beech	0.43	0	0	0	0	1	0	0	0	0
205	Oak	1.88	0	1	1	1	2	2	0	0	1
206	Beech	0.8	0	0	0	0	1	0	0	0	0
207	Beech	1.6	0	0	0	1	1	1	0	0	2
208.01	Beech	0.8	0	0	0	0	1	0	0	0	1
208.02	Beech	0.85	0	0	1	0	1	0	0	0	1
209	Beech	2.82	1	0	0	1	1	0	0	0	1
210	Beech	0.75	0	0	0	0	1	0	0	0	1
211	Beech	0.89	0	0	1	0	1	0	0	0	0
212	Beech	1.21	0	0	1	0	1	0	0	0	1
213.01	Beech	0.89	0	0	0	/	1	0	0	0	0
213.02	Beech	1.55	1	0	0	/	1	0	0	1	0
214	Holly	0.48	0	0	0	0	1	0	0	0	0
215	Beech	1.94	1	1	1	0	1	0	0	0	1
216	Beech	1.41	0	0	0	0	1	1	0	1	2
217	Beech	1.11	0	1	1	0	1	0	0	0	1
218	Oak	1.22	2	2	1	1	1	0	0	0	2
219	Oak	1.26	3	3	3	1	1	1	0	0	4
220	Beech	0.72	1	1	0	0	1	0	0	0	0
221	Beech	3.23	1	0	2	1	1	0	0	0	1
222.01	Beech	0.81	0	0	0	0	1	0	0	0	0
222.02	Beech	0.78	0	1	0	0	1	0	0	0	0
223	Beech	2.34	1	0	1	1	2	1	0	0	1
224	Oak	1.07	2	2	1	1	1	1	0	0	1
225 01	Beech	1.26	1	0	0	0	1	0	0	0	0
225.02	Beech	1.82	0	0	1	0	1	0	0	1	0
225.03	Beech	1.45	0	0	1	1	1	0	0	1	0
226	Beech	2.25	0	0	1	0	1	0	0	1	0
227	Whitebeam	0.42	0	0	1	0	1	0	0	0	0
228.01	Beech	0.94	0	0	1	0	1	0	0	0	0
228.02	Beech	0.97	0	0	0	0	1	0	0	0	0
229	Oak	1.33	1	1	1	1	1	0	0	0	1
230	Oak	0.78	2	2	2	1	1	0	0	0	1
231	Beech	0.52	0	0	1	0	1	0	0	0	1
232	Beech	2.75	1	0	1	0	3	0	0	0	1
233	Beech	1.37	0	0	0	0	1	0	0	0	0
234	Beech	1.32	1	0	0	0	2	0	0	0	1
235	Beech	1.08	1	0	0	0	1	0	0	0	0
236	Beech	1.36	1	0	1	1	0	1	0	2	1
237	Oak	1.31	2	2	1	2	3	1	0	2	2

Tree No.	Species	Girth	08/94	07/09/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
238	Beech	1.95	1	0	1	0	1	1	0	1	0
239	Beech	2.05	1	1	1	1	2	1	0	2	1
240	Oak	1.71	3	1	2	2	1	2	0	1	2
241	Beech	1.06	0	0	1	0	1	2	0	1	1
242	Oak	1	2	2	2	1	1	0	0	0	2
243	Oak	0.62	3	2	1	1	1	1	0	0	2
244	Beech	1.21	0	1	1	1	2	0	0	1	1
245	Beech	1.34	0	1	0	1	1	0	0	0	1
246	Beech	0.9	0	0	0	0	1	0	0	0	0
247	Oak	0.65	2	2	1	0	1	0	0	0	2
248	Oak	0.8	1	1	2	0	1	0	0	0	2
249.01	Beech	1.54	0	1	1	0	2	0	0	0	1
249.02	Beech	1.48	0	0	1	0	1	0	0	0	1
250	Beech	1.72	0	0	0	0	2	0	0	0	1
251	Oak	1.2	3	2	2	1	2	0	0	0	2
252	Oak	0.81	2	1	0	0	1	1	0	0	1
253	Oak	0.93	4	3	3	2	1	1	0	/	3
254	Oak	1.06	3	2	2	1	1	0	0	/	3
255	Oak	0.59	0	0	0	0	0	1	0	0	1
256	Beech	1.98	1	1	1	0	1	1	0	1	1
257.01	Beech	0.25	0	0	0	0	0	0	0	0	0
257.02	Beech	0.57	0	0	0	0	1	0	0	0	1
258	Beech	1.4	1	1	1	1	3	1	0	0	0
259.01	Beech	0.94	0	0	0	0	1	0	0	0	0
259.02	Beech	1.49	0	0	0	0	1	1	0	0	0
259.03	Beech	0.77	0	0	0	0	1	0	0	0	0
260	Group	0.044	0	0	0	0	0	0	0	0	0
261.01	Beech	1.45	0	0	1	1	1	0	0	3	0
261.02	Beech	0.96	0	0	1	0	1	0	0	3	1
262.01	Beech	0.69	1	1	0	1	2	0	0	0	0
262.02	Beech	0.48	0	0	0	0	1	0	0	0	1
263	Beech	1.53	0	1	1	0	2	0	0	3	1
264	Beech	1.71	0	1	1	1	2	0	0	1	0
265.01	Beech	0.8	1	0	0	1	1	1	0	0	0
265.02	Beech	0.48	/	/	0	1	0	0	0	0	0
265.03	Beech	0.39	/	/	0	0	1	1	0	0	0
265.04	Beech	0.37	/	/	0	0	0	0	0	0	0
266	Beech	1.36	1	0	0	1	1	0	0	2	0
267	Beech	1.26	1	0	1	0	1	0	0	1	0
268.01	Beech	0.7	0	0	1	1	1	0	0	1	0
268.02	Beech	0.97	0	1	0	0	2	1	0	1	1
269	Oak	1.77	1	1	2	2	0	0	0	2	1
270	Beech	0.93	1	0	0	1	1	0	0	0	1
271	Beech	1.75	1	0	1	0	2	1	0	1	1
272	Oak	1.6	3	0	2	1	0	1	0	0	1
273	Oak	1.95	3	2	2	0	1	1	0	0	2
274	Beech	0.93	0	0	0	0	1	0	0	0	0
275	Beech	0.96	0	0	0	0	0	0	0	0	0
276	Oak	1.93	3	2	2	0	1	2	0	0	3
277	Beech	1.43	0	0	0	0	2	1	0	0	2
278	Beech	1.99	0	1	0	1	1	0	0	0	1
279	Beech	1.4	0	0	0	1	1	0	0	0	1
280	Oak	1.45	4	2	2	3	1	3	0	3	2
281	Silver birch	0.65	0	0	1	2	1	1	0	2	1
282	Beech	1.04	0	1	1	1	1	1	0	0	0
283	Oak	0.8	0	1	1	0	1	2	0	0	2
284	Oak	0.58	0	0	1	0	1	1	0	0	1
285	Oak	0.5	0	1	0	1	1	3	0	/	1
286	Beech	0.62	0	0	1	0	1	0	0	0	0
287	Silver birch	0.72	0	0	1	1	1	1	0	3	1
288	Silver birch	0.63	0	0	1	1	0	0	0	3	1
289	Oak	0.93	3	2	1	1	1	1	0	1	2
290	Oak	0.65	1	2	1	1	1	2	0	0	1
291	Silver birch	1.01	1	0	1	1	1	1	1	2	2
292	Oak	1.75	4	2	2	3	2	2	0	0	1
293	Beech	0.31	0	1	0	1	1	0	0	0	1
294	Oak	0.52	1	1	1	0	1	1	0	0	1
295	Oak	0.85	1	1	1	1	1	1	0	0	1

Tree No.	Species	Girth	08/94	07/09/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
296	Beech	1.55	0	0	1	1	2	0	0	0	0
297	Beech	1.82	0	0	1	0	1	1	0	0	1
298	Oak	1.1	3	2	1	1	1	2	0	0	1
299	Beech	0.85	1	1	1	1	1	1	0	0	0
300	Beech	1.37	2	1	1	0	2	0	0	0	1
301	Oak	0.84	3	2	1	2	0	2	0	0	2
302	Beech	0.97	0	1	0	0	1	0	0	0	1
303	Beech	1.12	0	1	0	0	1	0	0	0	1
304	Beech	1.25	1	1	0	0	0	0	0	1	0
305	Beech	1.22	1	1	1	1	1	0	0	1	2
306	Beech	1.35	1	0	1	0	2	0	0	0	1
307	Beech	1.47	1	0	1	1	2	1	0	1	1
308	Beech	1.33	0	0	1	0	1	0	0	0	1
309	Oak	1.04	3	1	1	1	1	3	0	1	2
310	Beech	1.62	0	0	0	0	1	0	0	1	1
311	Beech	1.66	0	0	1	1	1	0	0	1	1
312	Oak	1.11	3	3	1	1	1	2	0	2	1
313	Beech	1.65	2	0	1	0	1	1	0	1	1
314	Oak	1.08	3	2	2	2	1	4	0	1	3
315	Beech	1.3	0	0	1	0	1	0	0	1	1
316	Beech	1.07	0	0	0	0	1	0	0	1	1
317	Beech	0.71	0	0	0	0	0	1	0	0	0
318.01	Beech	0.72	0	0	1	1	1	0	0	0	0
318.02	Beech	0.54	0	0	0	0	0	0	0	0	1
318.03	Beech	0.77	1	1	0	1	1	1	0	0	0
319	Oak	1.02	1	1	1	1	1	1	0	1	2
320	Oak	0 96	3	2	2	2	1	0	0	0	2
321	Oak	1.33	3	3	3	3	0	3	0	0	2
322	Oak	1.24	2	1	1	1	0	3	0	1	2
323	Oak	1.85	3	1	1	3	1	2	0	0	3
324	Oak	1.16	3	3	2	2	1	1	0	0	2
325	Oak	1.44	3	2	2	2	1	2	0	0	2
326	Oak	1.22	3	3	3	2	1	2	0	1	2
327	Beech	1.15	1	2	1	1	1	0	0	0	0
328	Beech	1.08	1	1	1	1	1	0	0	1	1
329	Beech	0.75	0	1	0	1	0	0	0	1	0
330	Beech	1.12	0	0	1	0	1	0	0	1	0
331	Oak	1.21	3	3	2	3	3	2	0	1	1
332	Beech	0 84	1	0	1	1	1	0	0	1	1
333	Beech	1.4	0	0	1	0	1	0	0	1	1
334	Oak	1.4	2	2	1	1	1	2	0	1	3
335	Oak	1.73	2	2	1	2	1	1	0	1	2
336	Oak	2	3	/	1	1	2	1	0	1	1
337	Oak	1.45	1	1	1	1	1	0	0	0	1
338	Oak	1.51	3	2	1	1	1	2	0	1	1
339	Oak	0.7	0	0	1	0	1	0	0	0	1
340	Oak	1.9	3	2	1	1	2	2	0	1	1
341	Oak	1.11	2	1	1	1	1	0	0	1	0
342	Duplicate of 259										
343	Beech	2.67	1	0	0	1	2	2	0	2	1
344	Oak	1.22	2	2	3	3	2	4	0	1	1
345											
346	Oak	0.74	/	1	1	1	0	0	0	0	1
347	Oak	1.21	/	3	1	3	1	1	0	1	2
348	Oak	1.63	3	3	3	5	2	3	0	1	1
349	Oak	0.75	0	1	1	1	1	1	0	0	1
350	Oak	2	0	2	1	1	1	2	0	1	1
351	Oak	1.02	0	0	1	1	1	1	0	0	1
352	Oak	0.46	0	0	0	1	0	0	0	0	1
353	Oak	0.77	0	0	1	0	0	0	0	0	1
354.01	Oak	0.63	0	0	0	0	0	0	0	0	1
354.02	Oak	0.47	0	0	0	0	0	0	0	0	0
355	Oak	0.33	0	0	0	0	1	0	0	0	0
356	Beech	0.32	1	0	1	0	0	0	0	1	0
357	Oak	1.88	2	2	3	1	2	1	0	1	3
358	Beech	2.68	0	0	1	1	1	0	0	1	1
359	Whitebeam	0.6	0	0	0	0	1	1	0	1	0
360	Beech	2.15	0	0	1	1	1	0	0	1	1

Tree No.	Species	Girth	08/94	07/09/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
361	Beech	0.82	0	0	1	1	2	0	0	2	0
362	Oak	1.23	1	1	1	1	1	0	0	1	2
363	Oak	1.2	2	2	2	1	1	1	0	2	1
364	Oak	2.04	1	2	3	1	2	1	0	1	2
365	Oak	1.26	1	2	2	1	1	1	0	2	1
366	Oak	0.95	0	1	0	0	1	1	0	1	1
367	Silver birch	1.06	0	0	2	1	2	0	0	3	0
368	Group	0.154	0	0	1	0	0	0	0	1	0
369	Beech	3.2	0	0	0	1	1	1	0	1	1
370.01	Silver birch	0.35	0	0	0	1	1	0	0	0	0
370.02	Silver birch	0.46	0	0	0	1	1	0	0	0	0
371	Holly	0.3	0	0	0	1	0	0	0	1	0
372	Oak	Duplicate of 336									
373	Beech	2.8	1	1	0	0	3	0	0	1	1
374.01	Oak	1.19	1	1	2	1	1	0	0	1	1
374.02	Oak	0.9	2	2	1	1	1	1	0	1	0
375.01	Whitebeam	0.21	0	0	0	0	1	0	0	0	0
375.02	Whitebeam	0.28	/	/	0	1	1	0	0	0	0
375.03	Whitebeam	0.26	/	/	0	0	0	0	0	0	0
376	Beech	2.87	0	0	1	1	3	1	0	1	1
377	Oak	1.24	2	2	3	1	2	1	0	1	/
378	Oak	1.04	1	1	3	3	2	1	0	1	1
379	Oak	1.45	2	1	1	1	3	1	0	0	2
380	Oak	1.06	1	2	1	1	4	0	0	0	0
381	Oak	0.93	1	0	1	1	2	0	0	1	1
382.01	Oak	0.52	0	0	1	1	1	0	0	0	0
382.02	Oak	0.4	0	0	1	1	1	0	0	0	0
383	Oak	0.9	0	0	1	1	1	1	0	0	0
384	Oak	1.25	0	1	3	1	1	1	0	1	1
385	Oak	1.38	3	3	4	3	2	2	0	1	2
386	Pine	0.42	0	0	0	0	1	0	0	0	0
387	Oak	1.04	1	1	2	1	1	0	0	1	1
388	Oak	1.15	3	2	3	1	1	2	0	1	2
389	Oak	1.28	2	2	3	2	1	1	0	1	1
390	Oak	1.09	1	1	1	1	1	0	0	0	1
391	Oak	0.76	1	0	1	1	0	0	0	0	1
392	Silver birch	0.93	0		0	1	0	0	0	1	0
393	Oak	0.97	1	1	1	1	1	0	0	1	1
394	Oak	1.14	0	1	0	1	1	0	0	0	1
395	Oak	1.46	1	1	1	1	2	2	0	1	2
396	Oak	1.24	3	3	3	1	1	2	0	1	2
397	Oak	1.01	2	2	3	1	1	1	0	1	2
398	Oak	1.5	3	2	4	2	1	2	0	2	1
399	Beech	2.11	1	1	1	0	3	0	0	1	1
400	Oak	1.17	2	1	1	1	2	1	0	2	2
401	Oak	0.86	1	0	1	1	1	0	0	1	2
402	Oak	0.56	0	0	1	0	1	0	0	0	1
403	Oak	1.57	2	3	3	2	2	3	1	1	3
404.01	Oak	0.94	2	1	0	1	1	1	0	1	1
404.02	Oak	0.6	0	1	1	1	1	0	1	0	1
405	Beech	0.76	0	0	1	1	1	0	0	2	1
406	Oak	1.21	4	4	4	3	3	3	0	3	3
407	Whitebeam	0.22	1	0	1	1	1	0	0	1	0
408	Oak	1.21	3	3	4	2	2	2	0	2	1
409	Oak	1.22	3	3	5	1	1	1	0	1	1
410	Oak	1.22	3	3	5	1	2	2	0	1	1
411	Oak	1.25	2	2	2	2	1	1	0	1	1
412	Oak	1.83	2	2	1	0	1	2	0	1	1
413	Oak	1.57	2	2	1	1	1	2	0	0	2
414	Beech	1.49	2	2	1	0	2	1	1	1	1
415	Whitebeam	0.9	0	0	1	0	1	1	0	2	0
416	Beech	1.79	1	0	1	1	3	1	0	1	1
417	Oak	1.05	3	2	4	2	1	2	0	1	2
418	Beech	1.19	2	2	1	1	2	1	0	1	2
419.01	Oak	0.75	1	1	3	2	2	1	0	1	3
419.02	Oak	1.11	2	2	3	1	2	0	0	1	1
420.01	Oak	1	1	1	3	2	2	2	0	2	2
420 02	Oak	1.24	2	3	3	1	2	3	0	2	3

Tree No.	Species	Girth	08/94	07/09/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
421	Oak	0.48	1	1	3	1	1	0	0	0	1
422.01	Oak	0.73	2	1	1	1	1	1	0	1	2
422.02	Oak	dead									
423	Oak	0.32	1	0	1	0	1	0	0	1	1
424	Whitebeam	0.16	1	0	1	0	1	0	0	0	0
425	Oak	0.8	1	1	1	2	2	2	0	1	3
426	Oak	0.75	2	1	2	1	1	1	0	1	2
427	Oak	0.75	2	1	1	1	1	1	0	0	1
428	Oak	0.68	1	1	2	0	1	0	0	0	2
429	Oak	0.8	2	2	0	1	1	1	0	1	1
430	Oak	1.09	3	3	4	2	1	2	0	2	2
431	Oak	0.71	2	1	1	1	1	0	0	2	2
432.01	Oak	0.64	1	0	0	0	1	0	0	0	1
432.02	Oak	1.13	0	2	1	1	1	1	0	1	2
433 01	Beech	1.65	1	1	1	0	3	0	0	1	1
433.02	Beech	1.14	/	/	1	0	3	1	0	0	0
434	Oak	0.82	0	1	1	0	1	1	0	0	1
435	Oak	0.66	0	0	2	1	1	0	0	0	1
436	Oak	1.25	2	3	3	2	1	3	0	1	2
437	Oak	0.92	3	2	1	1	1	0	0	1	1
438	Silver birch	0.54	0	0	1	0	1	0	0	1	0
439 01	Oak	0.56	2	2	3	3	2	1	0	1	3
439.02	Oak	0.42	1	1	2	2	1	0	0	1	1
440	Beech	3.53	1	0	1	1	3	1	0	1	1
441	Beech	3.08	3	2	1	2	3	1	0	1	2
442.01	Oak	0.74	3	3	2	3	1	3	0	1	2
442 02	Oak	0.7	3	2	2	2	1	2	0	1	2
443.01	Oak	1.22	2	2	2	1	1	0	0	1	1
443.02	Oak	0.68	0	0	1	2	1	0	0	1	1
444	Beech	1.63	0	0	1	1	1	0	0	1	1
445.01	Beech	0.63	0	0	1	1	3	0	0	1	1
445.02	Beech	0.99	0	0	0	1	3	0	0	1	1
445.03	Beech	0.36	0	0	0	1	3	0	0	0	1
446	Oak	0.55	/	0	1	0	1	0	0	0	1
447	Oak	1.14	3	4	5	3	3	3	1	2	4
448	Beech	2.96	2	1	2	1	3	2	0	2	2
449	Oak	0.83	2	1	3	1	2	2	0	0	1
450	Oak	0 52	0	1	1	1	2	1	0	0	1
451	Holly	0.2	0	0	1	1	1	0	0	1	1
452	Oak	0.49	1	0	1	1	1	0	0	0	1
453	Oak	1.83	2	3	4	3	4	4	0	1	3
454	Holly	0.41	0	0	1	1	1	1	0	1	0
455	Oak	1.16	2	2	2	1	2	1	0	0	3
456.01	Oak	0.37	0	0	1	0	1	1	0	0	1
456.02	Oak	0.21	0	0	1	1	1	0	0	0	1
457	Oak	0.63	1	1	2	1	1	2	0	1	1
458	Oak	0.8	2	2	3	2	1	2	0	1	2
459	Oak	0.71	2	2	3	1	1	2	0	1	1
460	Oak	0.2	0	0	1	1	0	0	0	0	0
464	Oak	1	0	1	1	1	2	2	0	0	1
462	Oak	1.29	2	2	3	0	1	1	0	1	1
463	Oak	0.96	2	2	3	1	2	3	0	0	2
464	Group	0.27	0	0	1	1	1	0	0	1	1
465	Oak	0.76	0	1	1	1	1	2	0	0	1
466	Oak	1.74	3	3	4	3	1	3	0	0	3
467	Oak	1.55	3	4	4	3	3	4	0	0	2
468	Oak	1.35	1	1	1	1	1	3	1	0	1
469	Oak	0.3	0	0	0	1	1	0	0	0	0
470	Oak	0.4	0	0	0	1	1	0	0	1	0
471	Oak	0.48	1	1	0	1	0	1	0	0	1
472	Oak	1.49	2	1	1	3	1	2	1	1	3
473	Group	0 23	0	0	0	0	1	0	0	1	1
474	Oak	1.63	3	3	1	1	1	3	0	1	1
475	Oak	1.63	3	2	3	1	1	2	0	1	3
476	Holly	0.3	0	0	1	0	1	0	0	0	0
477	Silver birch	0.95	0	0	0	1	1	0	0	2	0
478	Oak	1.15	2	2	2	2	2	3	0	1	2
479	Holly	0.06	0	0	0	0	0	0	0	0	1

Tree No.	Species	Girth	08/94	07/09/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
480	Oak	1.05	1	1	2	1	1	1	0	1	1
481	Oak	1.28	1	2	3	1	1	3	0	0	3
482	Oak	0.98	2	1	2	2	2	3	0	0	2
483	Oak	0.97	2	1	1	3	1	2	0	0	1
484	Beech	0.98	0	0	0	0	1	0	0	1	1
485	Beech	1.02	1	0	0	0	1	0	0	0	1
486	Beech	0.54	1	0	1	0	1	0	0	0	1
487	Oak	0.74	1	1	1	0	1	0	0	1	1
488	Oak	1.28	3	3	2	3	2	3	0	1	3
489	Oak	0.56	0	0	1	1	1	1	0	0	1
490	Oak	0.2	0	0	1	1	1	0	0	0	1
491	Oak	0.6	0	1	1	2	1	1	0	1	1
492	Oak	0.61	1	1	1	2	1	1	0	1	1
493	Silver birch	0.98	0	1	2	1	1	0	0	1	1
494	Beech	2.87	1	1	1	0	3	0	0	0	1
495	Beech	1.55	3	0	2	1	3	3	0	1	2
496	Oak	2.06	/	2	2	1	0		0	0	3

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Tree No.	Species	Girth	08/94	07/09/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
1	Oak	1.31	4	3	4	3	3	4	2	1	3
2	Oak	1.2	2	1	2	2	1	1	0	0	1
3	Oak	1.4	3	3	3	2	2	1	0	1	2
4	Oak	1.08	3	3	3	2	3	2	0	1	2
5	Oak	0.78	2	1	1	1	1	0	0	0	1
6	Oak	1.17	1	1	2	2	1	2	0	0	2
7	Oak	1.22	2	2	3	1	3	3	0	1	1
8	Oak	1.1	1	2	2	1	1	1	0	0	1
9	Oak	0.4	0	1	1	1	1	1	0	0	0
10	Beech	2.23	2	1	1	2	3	1	1	1	0
11	Oak	1.39	3	1	3	3	2	3	0	1	3
12	Oak	1.13	4	3	3	3	3	3	1	0	3
13	Oak	0.81	2	2	2	3	1	1	0	0	1
14	Oak	0.83	1	1	2	2	1	1	0	0	1
15	Oak	1.36	4	3	4	3	1	3	0	0	3
16	Oak	0.98	3	3	3	3	1	2	0	1	2
17	Oak	0.17	0	1	1	1	1	0	0	0	0
18	Oak	1.33	3	3	3	2	2	3	1	0	3
19	Holly	0.33	0	0	0	1	1	1	0	0	0
20	Oak	1.48	3	2	3	3	1	2	0	1	2
21	Oak	1.07	3	2	2	1	1	1	0	0	1
22	Oak	1.19	2	2	2	1	1	1	0	1	2
23	Silver birch	0.06	0	0	0	0	0	0	0	0	0
24	Beech	0.08	0	0	0	1	1	1	0	0	0
25	Silver birch	dead									
26	Oak	0.99	2	2	1	1	1	1	0	0	1
27	Oak	1.11	1	1	2	1	1	1	0	0	1
28	Oak	1.21	3	2	2	2	1	1	0	0	1
29	Holly	0.06	0	0	0	0	1	0	0	0	0
30	Oak	1.36	3	3	3	2	1	3	0	0	0
31	Oak	0.66	1	1	2	2	1	1	0	0	2
32	Silver birch	0.09	0	0	1	1	1	0	0	1	1
33	Silver birch	0.3	0	0	0	0	1	0	0	0	2
34	Silver birch	0.28	0	0	0	0	1	0	0	0	2
35	Silver birch	0.4	0	0	1	1	1	1	0	0	1
36	Beech	0.06	0	0	0	0	0	0	1	0	0
37	Silver birch	0.1	0	0	0	0	0	1	0	0	0
38	Silver birch	0.16	0	0	0	0	1	1	0	0	1
39	Silver birch	0.46	1	0	1	0	1	0	0	0	0
40	Silver birch	0.12	0	0	0	0	0	0	0	0	1
41	Beech	0.05	0	0	0	1	1	0	0	0	0
41.1	Beech	0.12	0	1	0	1	0	0	0	0	0
42	Beech	0.15	1	0	1	2	1	1	1	0	1
43	Oak	1.58	4	3	3	3	1	3	1	0	3
44	Beech	1.78	3	3	2	3	4	3	2	1	4

Tree No.	Species	Girth	08/94	07/09/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
45	Beech	0.12	0	1	1	1	3	2	0	0	0
46.01	Beech	0.89	2	1	1	1	3	2	0	0	1
46.02	Beech	0 55	0	1	1	1	3	2	0	0	1
47	Oak	1.9	1	1	2	3	1	1	0	0	3
48	Beech	3 38	0	0	0	1	1	1	0	0	1
49	Silver birch	0.04	0	0	0	1	0	0	0	0	0
50	Beech	0.23	1	0	1	1	1	0	0	1	1
51	Oak	1.51	3	3	3	3	2	1	0	0	3
52	Silver birch	0.25	0	0	0	0	1	0	0	0	0
53	Silver birch	0.21	0	1	0	1	1	0	0	0	1
54	Beech	0.13	0	0	0	1	0	0	0	0	1
55	Silver birch	0.5	0	1	1	1	1	1	0	1	2
56	Silver birch	0.17	0	0	0	0	0	1	0	0	1
57	Silver birch	0.15	0	0	0	0	0	0	0	0	0
58	Silver birch	0.37	0	1	2	0	1	0	0	1	2
59	Silver birch	0.24	0	0	0	0	1	0	0	1	1
60	Silver birch	0.18	0	0	1	1	1	1	0	1	1
61	Silver birch	0.23	0	0	0	0	0	0	0	0	1
62	Beech	0.2	1	0	1	1	1	1	0	0	0
63	Silver birch	0.26	0	1	0	1	1	0	0	0	0
64	Beech	0.12	0	0	0	1	0	1	1	0	0
65	Beech	2.13	1	0	1	2	1	0	0	0	1
66.01	Oak	1.14	3	2	3	3	2	3	1	0	3
66.02	Oak	0.28	1	0	0	1	0	0	0	0	1
67	Oak	1.17	3	2	3	2	3	3	0	0	3
68.01	Beech	0.65	2	1	0	1	1	1	0	0	0
68.02	Beech	0.52	0	1	1	1	1	0	0	0	0
68.03	Beech	0.44	0	1	0	0	0	0	0	0	0
69	Beech	fallen down									
70	Beech	1.52	1	1	1	2	2	0	0	0	1
71	Oak	2.54	5	3	3	3	4	4	1	1	3
72	Oak	1.42	3	2	1	1	2	2	0	0	1
73	Oak	1.3	1	1	2	1	1	1	0	0	2
74	Silver birch	0.09	0	0	1	0	0	0	0	0	0
75	Silver birch	0.32	0	1	0	0	1	0	0	1	0
76	Silver birch	0.25	0	1	1	1	0	0	0	0	0
77	Silver birch	0.13	0	0	0	0	0	0	0	0	0
78	Silver birch	0.09	0	0	0	0	0	0	0	0	0
79	Oak	0.12	0	0	1	0	0	0	0	0	0
80	Silver birch	0.17	0	0	0	1	0	0	0	0	1
81	Silver birch	0.11	0	0	0	0	0	0	0	0	0
82	Beech	0.02	0	/	0	0	1	0	0	0	0
83	Oak	1.24	3	3	3	3	3	3	0	0	3
84	Silver birch	0.1	0	0	0	1	1	0	0	0	0
85	Silver birch	0.25	0	0	1	0	0	0	0	1	1
86	Silver birch	0.31	0	0	1	0	1	0	0	0	2
87	Silver birch	0.17	0	0	0	0	0	0	0	0	1
88.01	Silver birch	0.21	0	0	0	0	1	0	0	1	1
88.02	Silver birch	0.23	0	0	1	0	0	1	0	1	1
88.03	Silver birch	0.13	0	0	0	0	0	0	0	0	0
89	Silver birch	0.28	2	1	0	0	0	0	0	0	0
90	Silver birch	0.18	0	0	1	0	1	0	0	2	0
91	Silver birch	0.22	0	0	0	0	1	0	0	1	0
92	Whitebeam	0.08	0	0	0	0	0	0	0	0	0
93	Silver birch	0.08	0	0	0	0	0	0	0	0	0
94	Silver birch	0.08	0	0	0	0	0	0	0	0	0
95	Silver birch	0.15	0	0	1	0	0	0	0	0	0
96	Silver birch	0.28	0	1	0	0	1	0	0	2	1
97	Whitebeam	0.09	0	0	0	0	1	0	0	0	0
98	Silver birch	0.16	0	0	0	1	0	0	0	0	0
99	Silver birch	0.08	0	0	0	0	1	0	0	0	0
100	Silver birch	0.22	0	0	0	0	0	0	0	0	0
101	Silver birch	0.21	0	0	0	1	1	0	0	0	0
102	Silver birch	0.12	0	1	0	0	0	0	0	0	0
103	Beech	0.05	0	0	0	0	0	0	0	0	0
104	Silver birch	0.21	0	0	0	0	0	0	0	0	0

Tree No.	Species	Girth	08/94	07/09/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
105	Oak	1.62	4	3	3	3	3	2	1	0	3
106	Oak	1.64	4	3	4	3	3	3	1	2	3
107	Beech	0.3	0	0	0	0	1	0	0	0	0
108.01	Beech	0.35	2	1	2	2	2	2	1	1	1
108.02	Beech	0.72	0	1	2	1	0	0	0	0	1
108.03	Beech	0.19	0	1	0	1	0	0	0	1	0
108.04	Beech	0.5	1	0	2	0	0	0	0	0	0
108.05	Beech	0.41	0	1	0	0	0	0	0	0	0
109.01	Beech	0.8	0	1	0	0	1	0	0	0	0
109.02	Beech	0 64	0	0	1	0	1	0	0	0	0
109.03	Beech	0.66	0	1	0	0	1	0	0	0	0
110	Oak	1.33	3	2	3	3	2	3	0	1	3
111	Oak	1.69	4	2	3	3	2	2	0	1	3
112	Holly	0.39	0	0	1	0	0	0	0	0	0
113	Holly	0.34	0	0	1	0	0	0	0	0	0
114	Holly	0.24	0	0	0	0	1	0	0	0	0
115	Holly	0.15	0	0	0	0	0	0	0	0	0
116	Holly	0.15	0	0	0	0	0	0	0	0	0
117	Holly	0.1	0	0	0	0	0	0	0	0	0
118	Holly	0.34	0	0	1	0	2	0	0	0	1
119	Holly	0.33	0	0	0	0	1	0	0	0	0
120	Holly	0.1	0	0	0	0	0	0	0	0	0
121	Beech	1.25	2	1	0	1	2	2	0	1	1
122.01	Beech	0.58	1	1	1	1	1	2	0	0	1
122.02	Beech	1.88	2	1	1	1	2	2	0	0	2
123	Beech	2.09	0	1	1	0	3	1	0	0	1
124	Beech	1.82	1	1	1	1	3	2	0	0	1
125	Beech	1.17	1	1	0	1	1	1	0	1	1
126	Oak	0.83	0	0	1	1	1	0	0	0	1
127	Beech	0.03	1	0	0	0	1	0	0	1	1
128	Silver birch	0.3	1	1	1	0	1	1	0	2	1
129	Silver birch	0.08	0	0	0	0	1	0	0	1	1
130	Silver birch	0.2	1	0	0	1	0	0	0	2	1
131	Silver birch	0.06	0	1	0	2	0	0	0	0	1
132	Silver birch	0.15	1	0	1	1	1	0	0	0	0
133	Silver birch	0.25	0	1	1	2	1	0	0	1	2
134	Silver birch	0.07	1	0	0	/	0	0	0	0	0
135	Silver birch	0.33	1	0	1	1	2	1	1	2	0
136	Silver birch	0.27	0	0	1	1	1	1	0	1	1
137	Silver birch	0.12	1	0	1	0	0	0	0	0	1
138	Silver birch	0.12	0	0	1	0	1	0	0	0	0
139	Silver birch	0.19	0	0	1	0	2	0	0	0	3
140	Silver birch	0.36	1	0	0	3	2	0	0	3	3
141	Whitebeam	0.05	0	0	0	0	0	0	0	0	0
142	Silver birch	0.09	0	0	0	1	0	0	0	0	0
143	Silver birch	0.43	1	1	2	2	2	1	0	2	3
144	Holly	0.13	0	0	0	2	1	0	0	1	1
145	Holly	0.21	1	0	0	2	1	1	0	2	2
146	Silver birch	0.17	0	0	0	1	1	1	0	2	1
147	Silver birch	0.09	0	0	0	0	1	1	0	1	1
148	Silver birch	0.05	0	0	0	0	1	0	0	0	0

Dimsdale grid 2

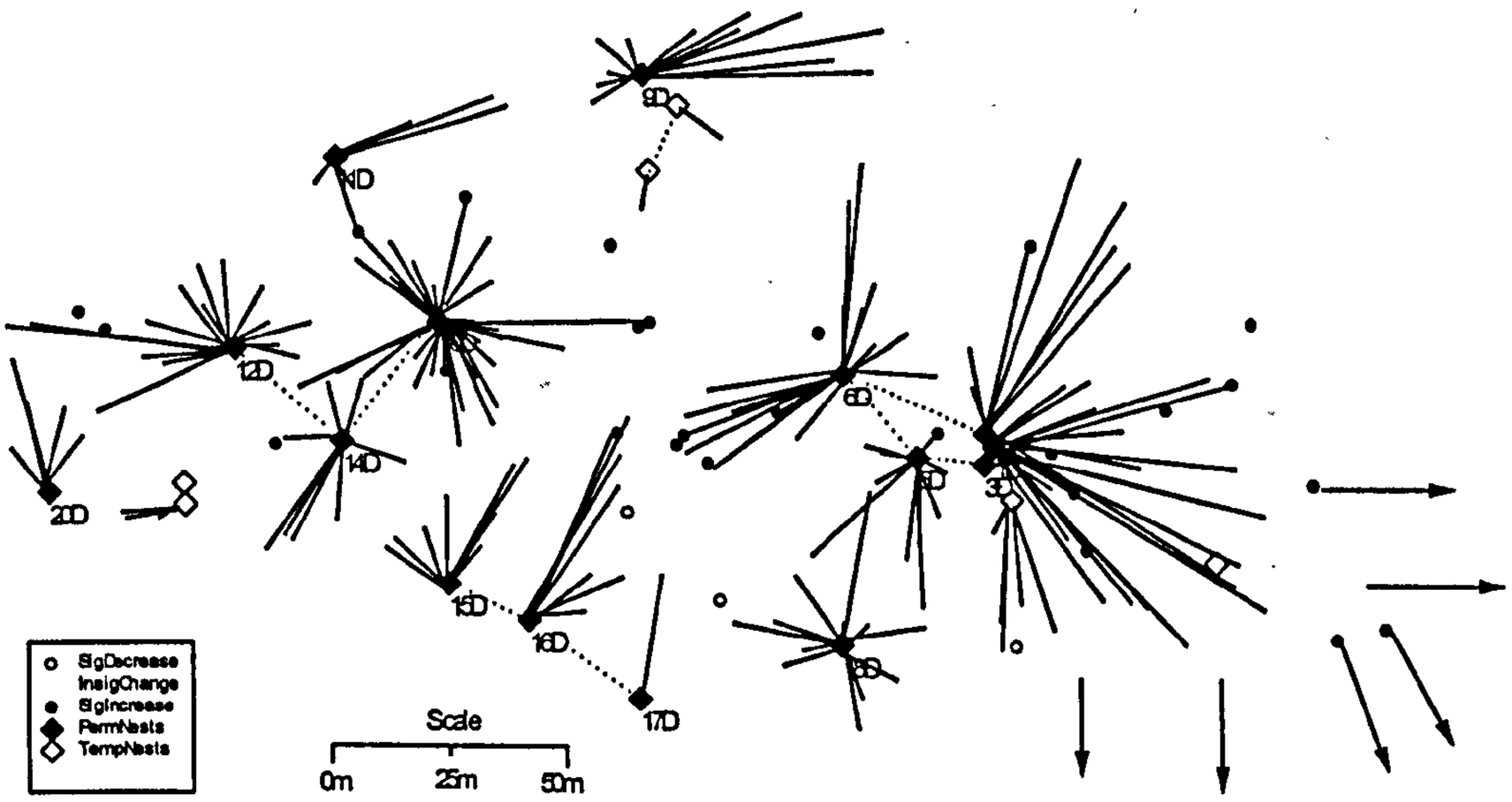
Tree No.	Species	Girth	08/94	07/09/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
1	Beech	1.65	0	0	1	1	1	0	0	1	1
2.01	Beech	1.11	0	0	1	1	1	0	0	1	1
2.02	Beech	1.09	0	0	2	1	1	0	0	1	0
3	Oak	1.03	3	2	3	3	1	2	0	1	3
4	Oak	0.85	1	1	2	2	1	1	0	1	3
5	Beech	0.8	1	1	0	0	1	0	0	0	0
6.01	Oak	0.93	3	2	1	2	1	2	1	1	3
6.02	Oak	0.97	3	2	2	2	1	2	0	0	3
7.01	Silver birch	0.19	0	1	1	1	1	0	0	1	1
7.02	Silver birch	dead									
8	Oak	0.44	0	0	0	1	0	0	0	1	1
9	Beech	0.04	0	0	0	0	0	0	0	0	1
10	Beech	1.87	0	0	1	1	2	0	0	1	1
11 01	Oak	0.54	3	1	1	2	1	1	0	1	2
11.02	Oak	0.92	2	1	2	2	1	1	0	1	1
12	Oak	1.24	3	3	3	3	1	2	0	2	3
13	Beech	1.6	3	1	1	1	2	1	0	1	1
14	Beech	1.72	1	0	1	1	2	1	1	1	3
15	Oak	1.21	3	2	3	3	1	2	1	1	3
16	Silver birch	0.12	0	0	0	0	1	0	0	1	0
17	Beech	1.02	1	1	1	1	1	0	0	1	1
18	Oak	0.36	0	0	2	1	1	0	0	0	0
19	Silver birch	0.24	1	0	1	1	1	0	0	1	0
20	Oak	1.58	3	2	3	3	1	2	0	1	3
21	Whitebeam	0.15	0	0	0	0	0	0	0	1	0
22	Beech	0.61	0	0	1	0	1	0	0	1	0
23.01	Beech	3.06	4	2	1	1	2	1	0	1	2
23.02	Beech	0.22	1	0	0	0	1	0	0	1	0
24	Beech	1.11	3	2	0	1	2	0	0	1	2
25	Oak	0.97	2	1	1	2	1	3	0	0	2
26	Beech	0.02	0	0	0	0	0	0	0	0	0
27	Beech	0.04	0	0	0	0	0	0	0	0	0
28	Beech	0.04	0	0	0	0	0	0	0	0	0
29	Beech	0.03	0	0	0	0	0	0	0	0	0
30	Beech	0 02	0	0	0	0	0	0	0	0	0
31	Beech	2.2	1	0	1	1	2	1	0	1	1
32	Beech	0.03	0	0	0	0	0	0	0	0	0
33	Beech	1.5	1	1	1	1	2	1	0	1	1
34 01	Whitebeam	0.7	1	0	1	1	1	1	0	1	1
34.02	Whitebeam	0.13	0	0	0	0	1	0	0	1	0
34.03	Whitebeam	0.13	0	0	0	0	0	0	0	1	0
35	Whitebeam	dead									
36	Silver birch	0.25	1	1	2	2	2	1	0	0	1
37	Oak	0.12	/	0	0	0	1	0	0	0	0
38	Beech	2.08	1	1	2	1	2	0	0	1	1
39	Beech	1.06	1	1	0	1	2	2	0	0	2
40	Beech	1.16	1	1	1	1	3	0	0	1	1
41	Oak	1.04	3	2	3	3	1	3	0	1	3
42	Silver birch	0.05	2	1	1	2	1	1	0	1	1
43	Beech	0.53	4	3	2	1	2	3	2	2	3
44	Oak	0.95	3	2	2	3	2	3	0	1	3
45	Beech	0.03	0	0	0	0	0	0	0	0	0
46	Beech	0.03	0	0	0	0	0	0	0	0	0
47	Beech	0.02	0	0	0	0	0	0	0	0	0
48	Beech	0.02	0	0	0	0	1	0	0	0	0
49	Beech	0.06	0	0	0	0	0	0	0	0	0
50	Beech	0.04	0	0	0	0	0	0	0	0	0
51	Oak	1.03	2	2	2	3	2	1	0	1	3
52	Oak	0.99	2	1	1	3	1	1	1	1	2
53	Beech	0.04	0	0	0	0	0	0	0	0	0
54	Beech	0.06	0	0	0	1	1	0	0	1	0
55	Beech	0.09	0	1	0	1	1	0	0	0	0
56	Beech	0.05	0	0	0	1	0	0	0	1	1
57	Beech	0.03	0	0	0	0	1	0	0	0	0
58	Beech	0.05	0	0	0	0	1	0	0	0	0
59	Whitebeam	0.04	0	0	0	0	0	0	0	0	1
60	Oak	1.39	3	3	3	3	1	2	0	0	3

Tree No.	Species	Girth	08/94	07/09/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
61	Whitebeam	0.04	0	0	1	0	0	0	0	0	0
62	Beech	2.75	2	1	1	0	3	1	0	0	0
63	Whitebeam	0.07	0	0	0	0	0	0	0	0	0
64	Silver birch	0.07	0	0	0	0	0	0	0	0	0
65	Whitebeam	0.09	0	0	0	0	0	0	0	0	0
66	Whitebeam	0.09	0	0	0	0	0	0	0	0	0
67	Whitebeam	0.09	0	0	3	1	1	0	0	0	0
68	Oak	1.2	3	3	1	3	1	0	0	1	3
69	Beech	3.51	4	2	4	2	4	2	0	1	0
70	Oak	1.29	4	3	3	3	1	4	0	/	5
71	Oak	1.01	3	/	2	3	2	3	0	1	3
72	Oak	1.09	3	2	0	2	1	2	0	0	2
73	Beech	0.08	0	0	3	0	0	0	0	1	0
74	Oak	1.45	3	2	2	3	1	2	0	0	3
75	Oak	0.98	2	1	0	3	1	1	0	0	3
76	Beech	0.07	0	0	3	0	1	0	0	1	0
77	Oak	0.86	3	2	3	3	1	3	0	1	3
78	Oak	0.68	2	1	2	2	1	2	0	2	3
79.01	Oak	0.79	2	1	2	2	1	1	0	1	3
79.02	Oak	0.49	2	1	2	2	1	1	0	1	3
80	Beech	3.81	0	1	4	1	1	0	0	1	1
81.01	Oak	0.95	3	3	4	2	1	3	0	1	4
81.02	Oak	1.17	3	3	3	3	1	3	0	1	4
82	Oak	1.08	3	2	3	3	1	2	0	1	4
83	Beech	0.15	0	0	0	1	1	0	0	1	1

Appendix F: Difference maps for Dimsdale (whole site) for 1994 to 1996

Figure F.1: Difference in foraging activity between adjacent counts for Dimsdale whole site counts a) 08/94 with 07/09/94 b) 07/09/94 with 08/94

a)



b)

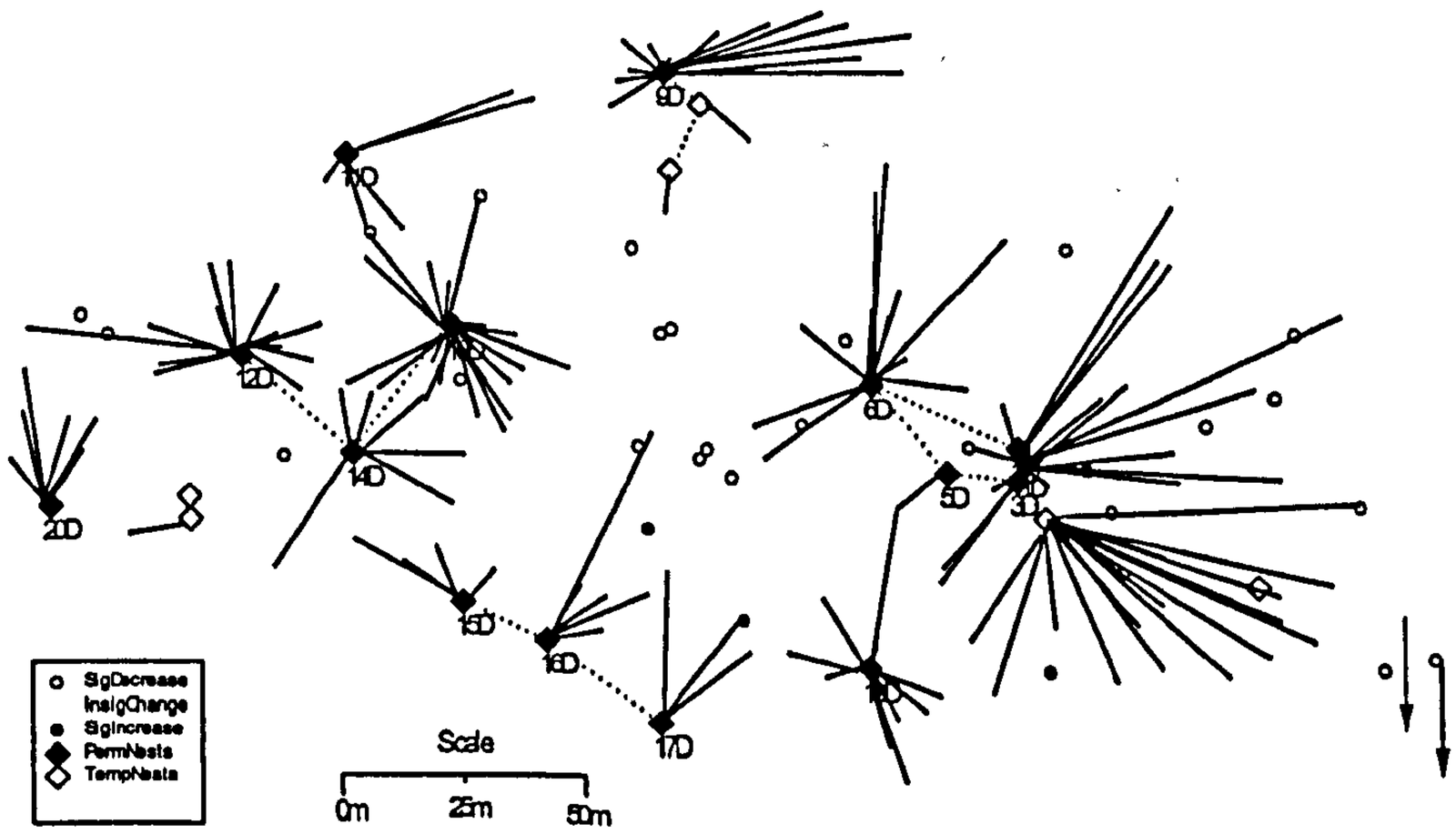
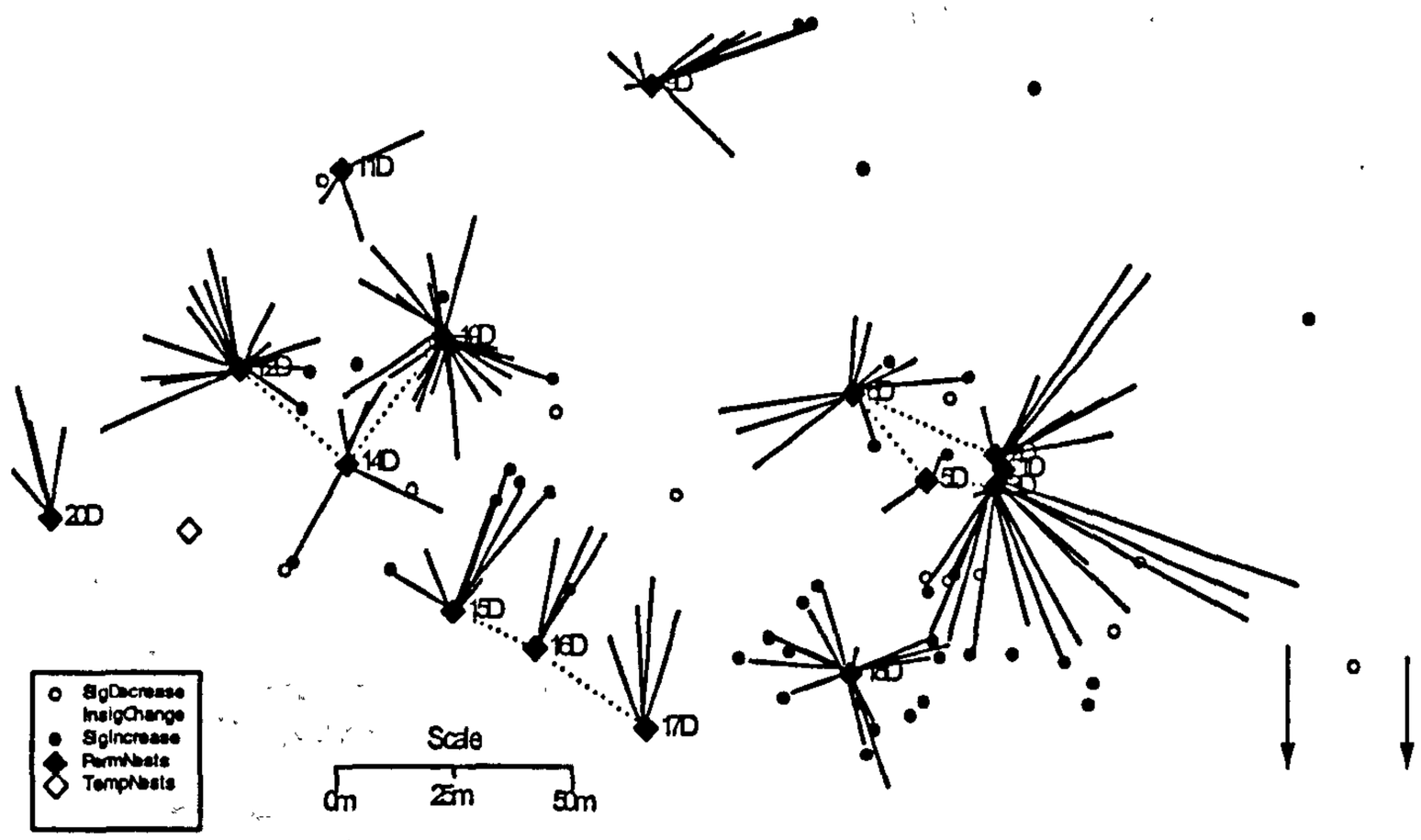


Figure F.2: Difference in foraging activity between adjacent counts for Dimsdale whole site counts a) 12/04/95 with 24/05/95 b) 24/05/95 with 012/04/95

a)



b)

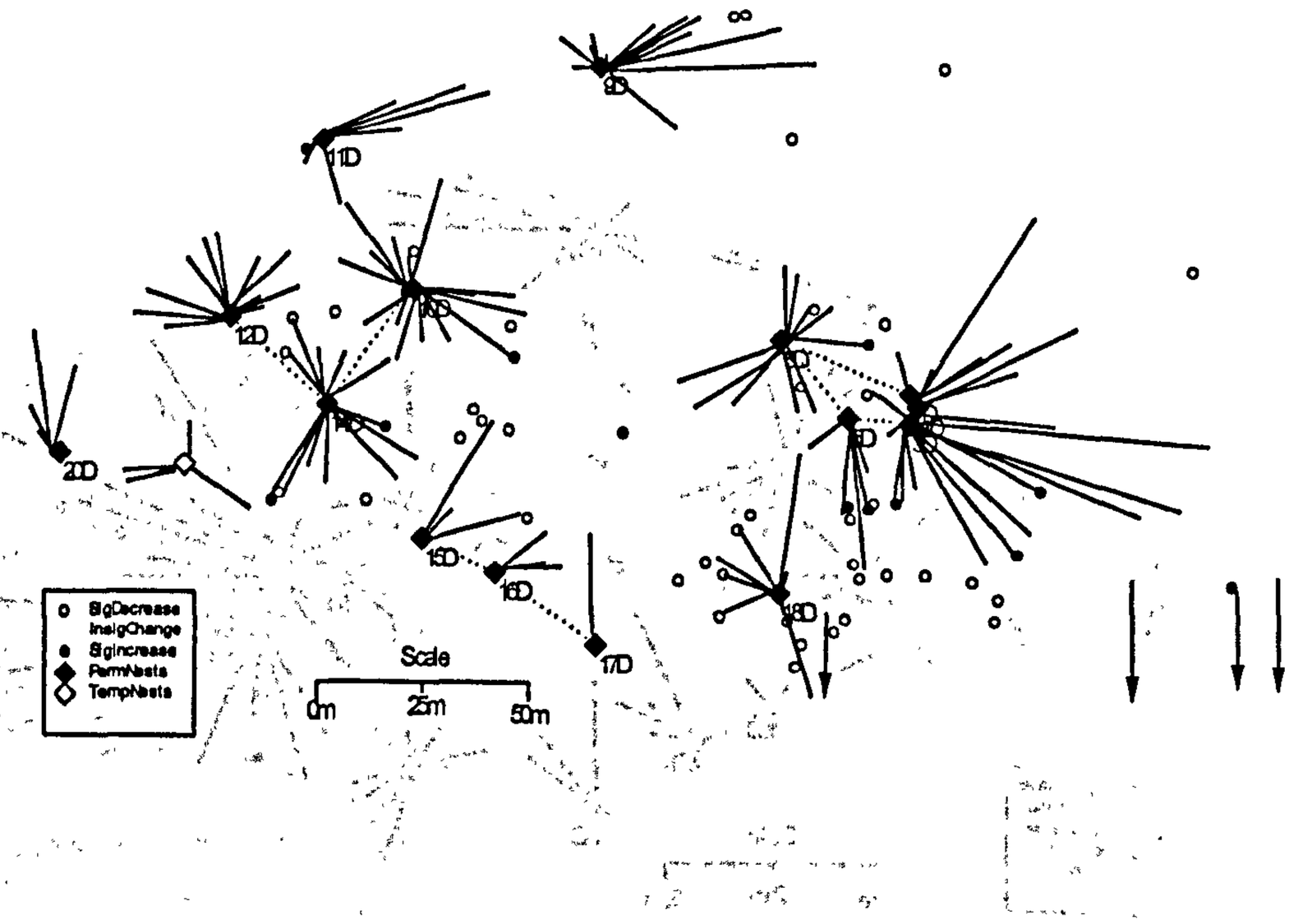
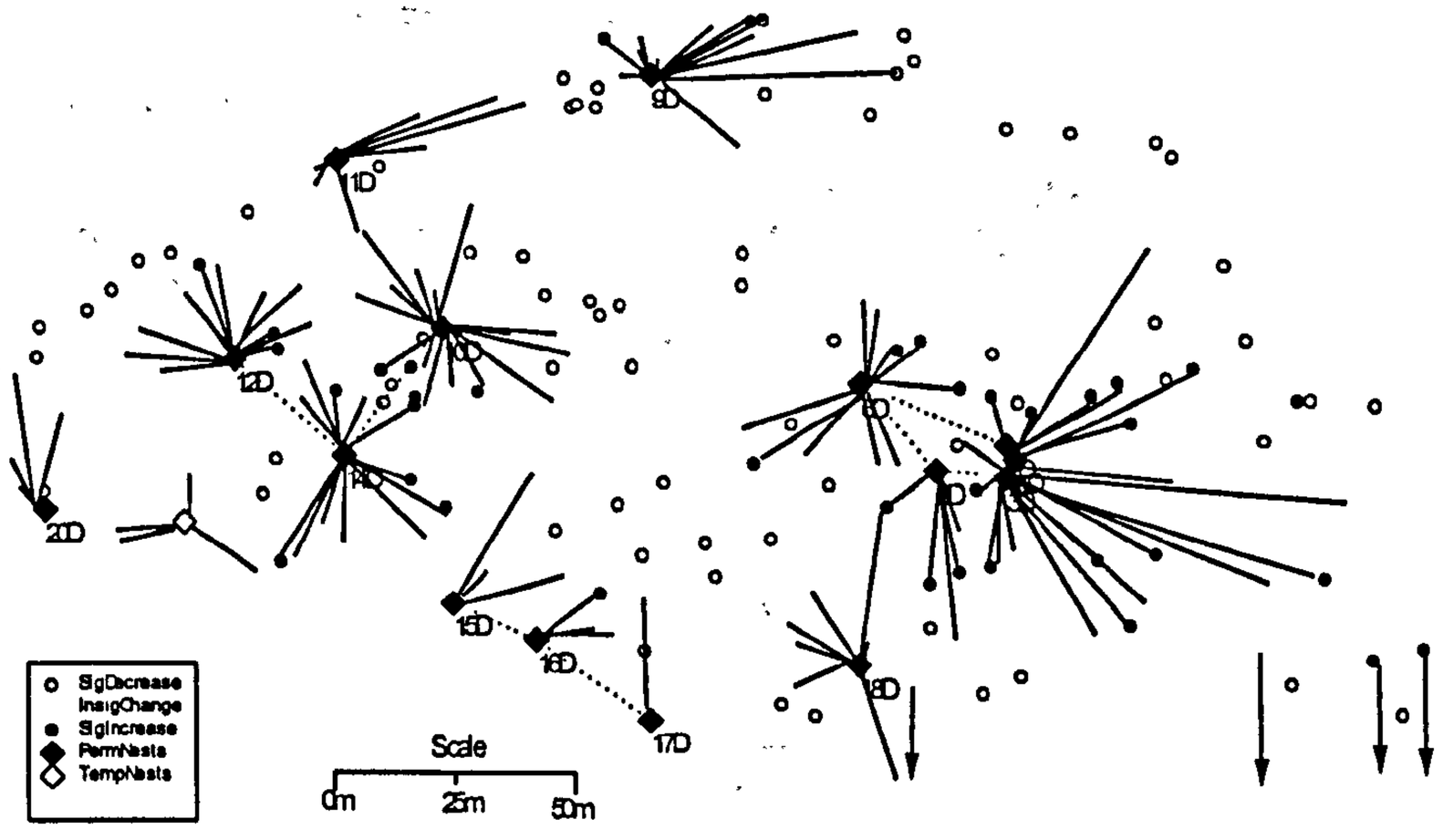


Figure F.3: Difference in foraging activity between adjacent counts for Dimsdale whole site counts a) 24/05/95 with 19/07/95 b) 19/07/95 with 24/05/95

a)



b)

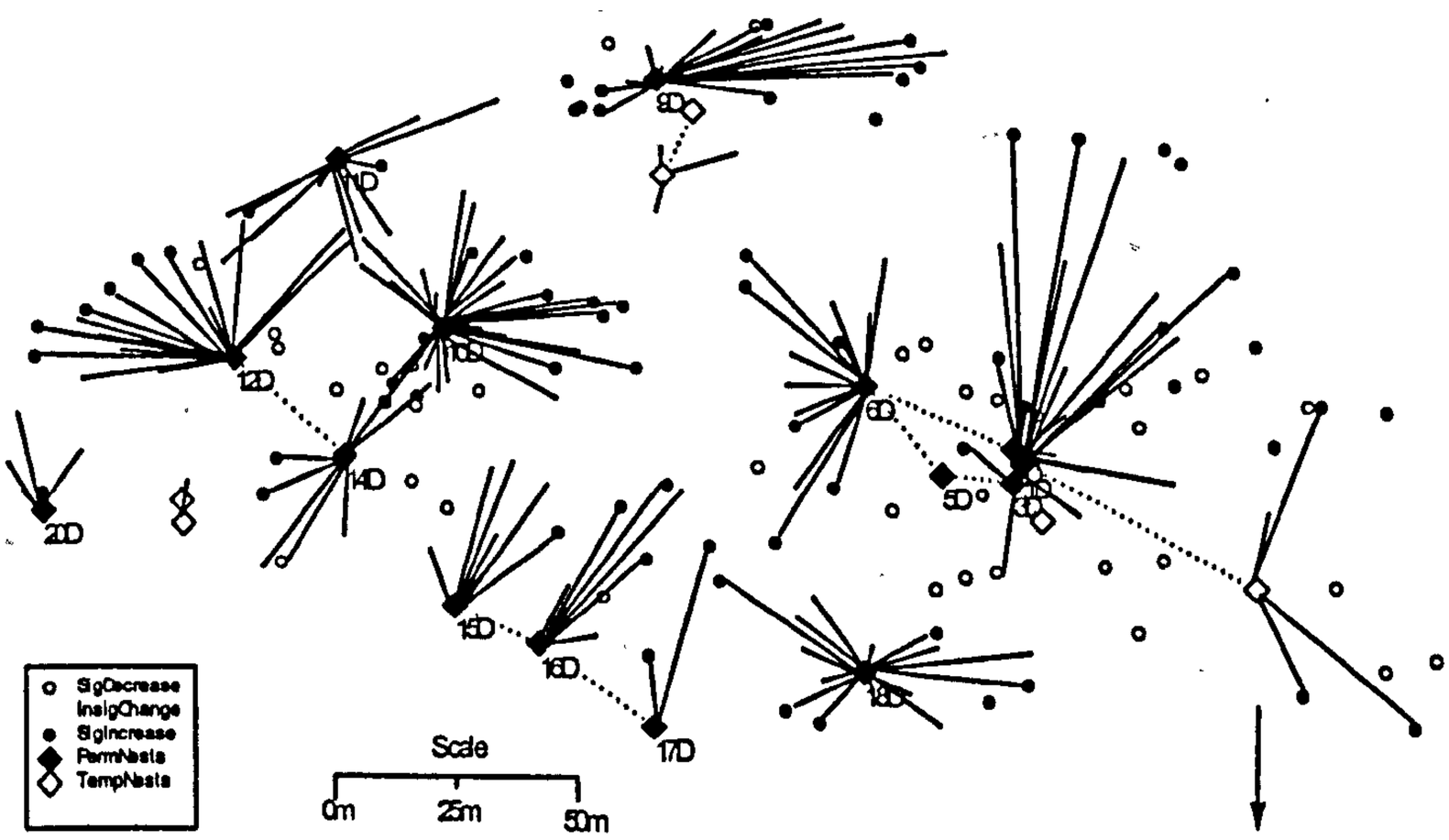
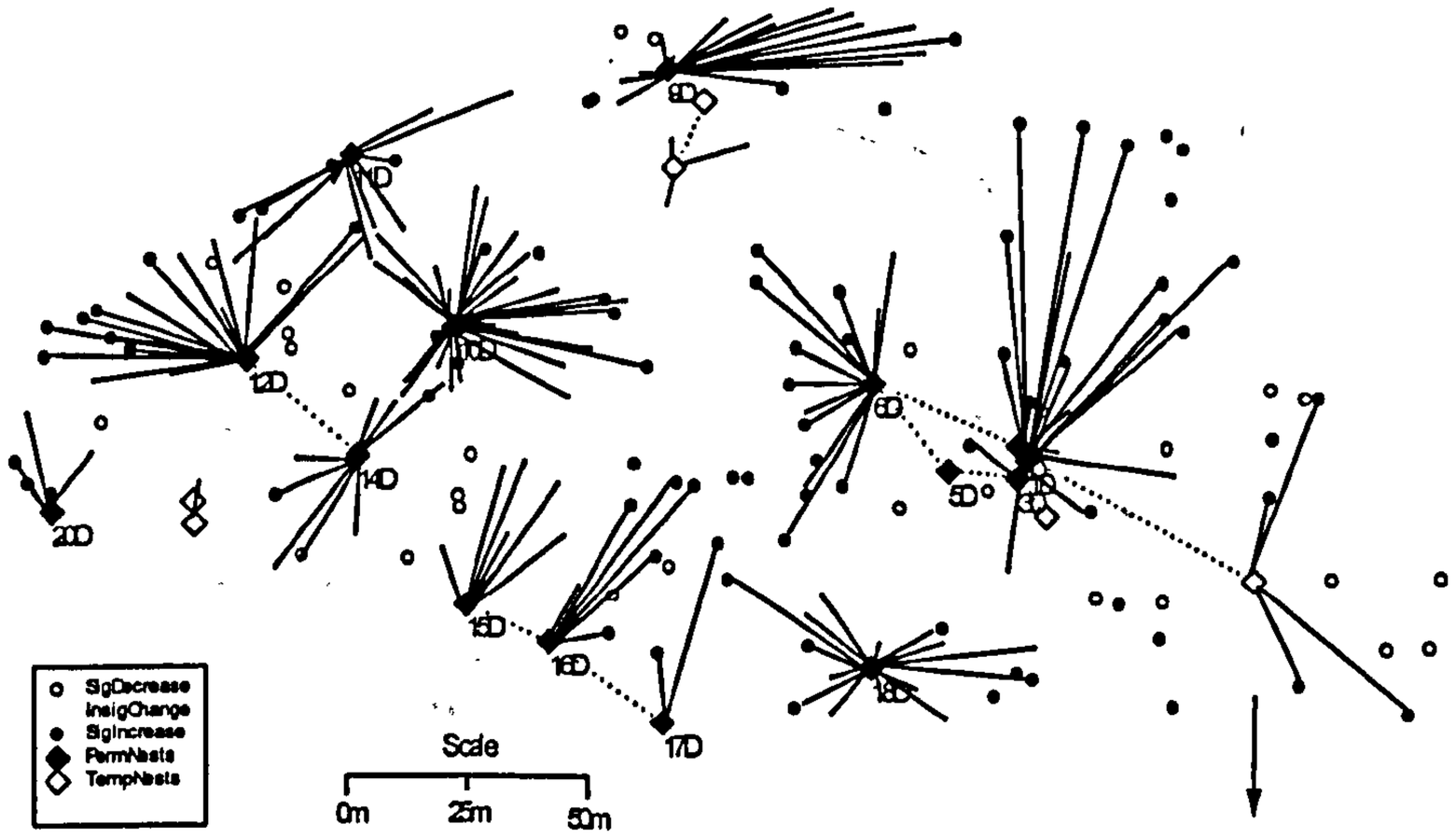


Figure F.4: Difference in foraging activity between adjacent counts for Dimsdale whole site counts a) 19/07/95 with 06/09/95 b) 06/09/95 with 19/07/95

a)



b)

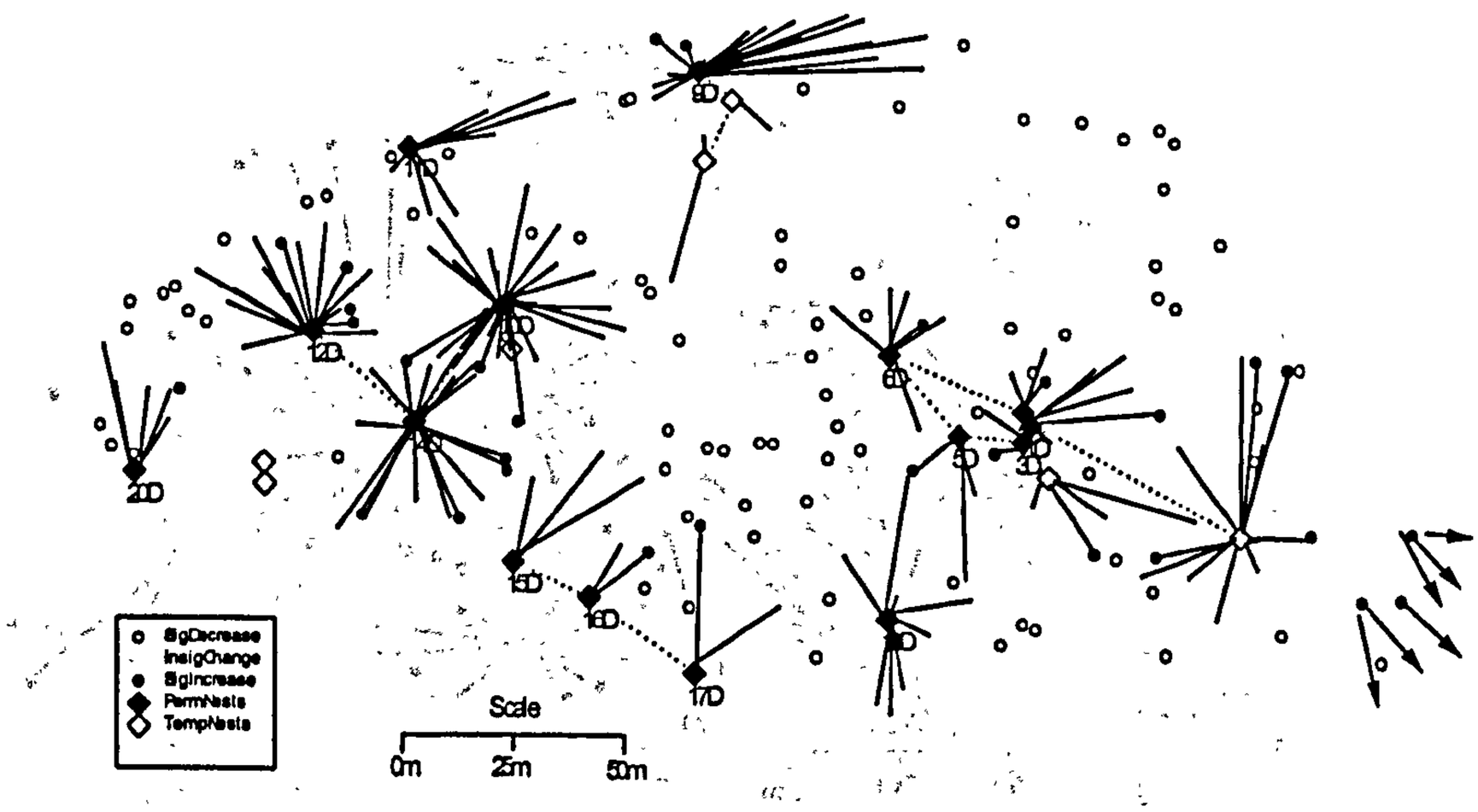
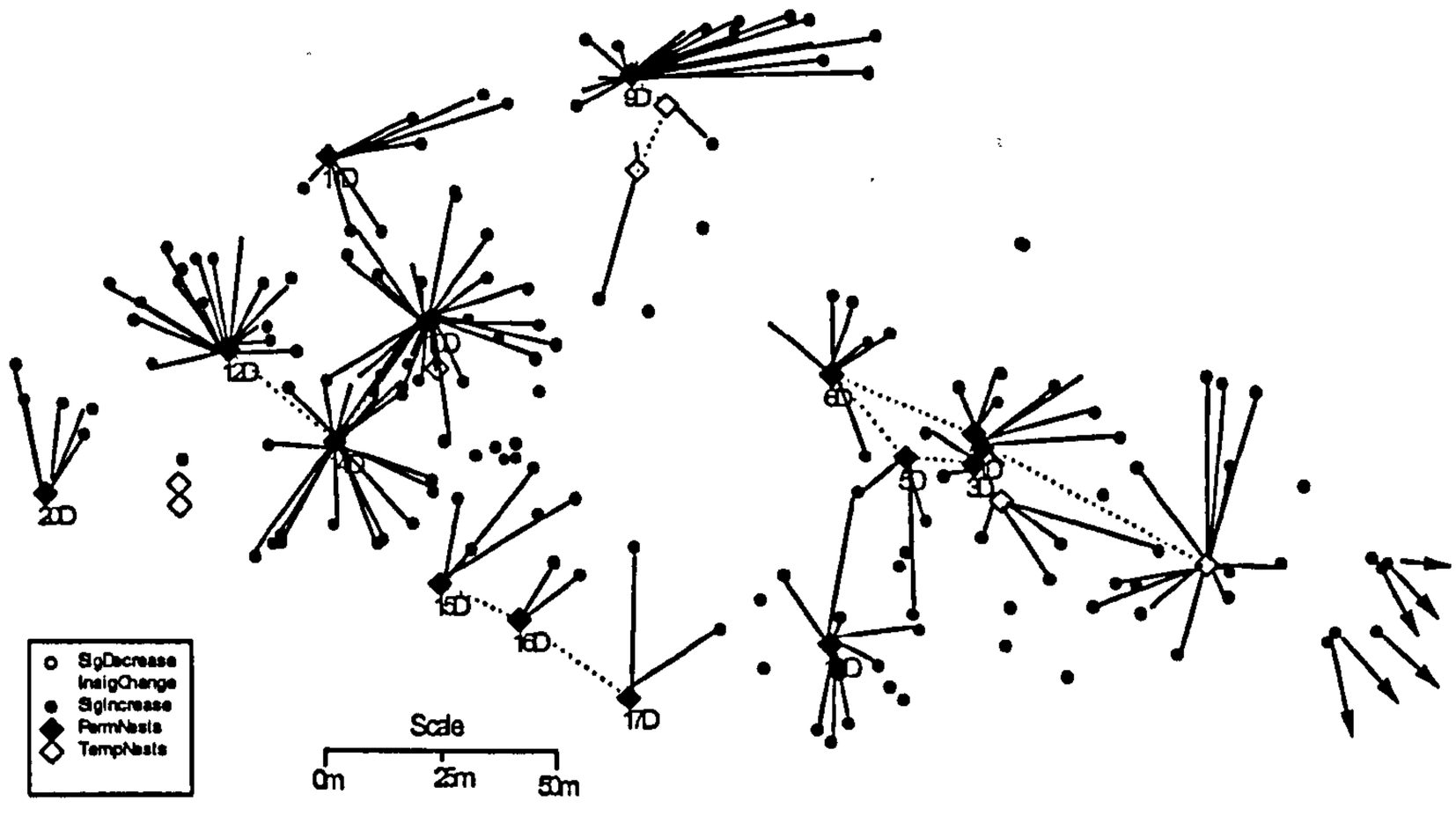


Figure F.5: Difference in foraging activity between adjacent counts for Dimsdale whole site counts a) 06/09/95 with 15/11/95 b) 15/11/95 with 06/09/95

a)



b)

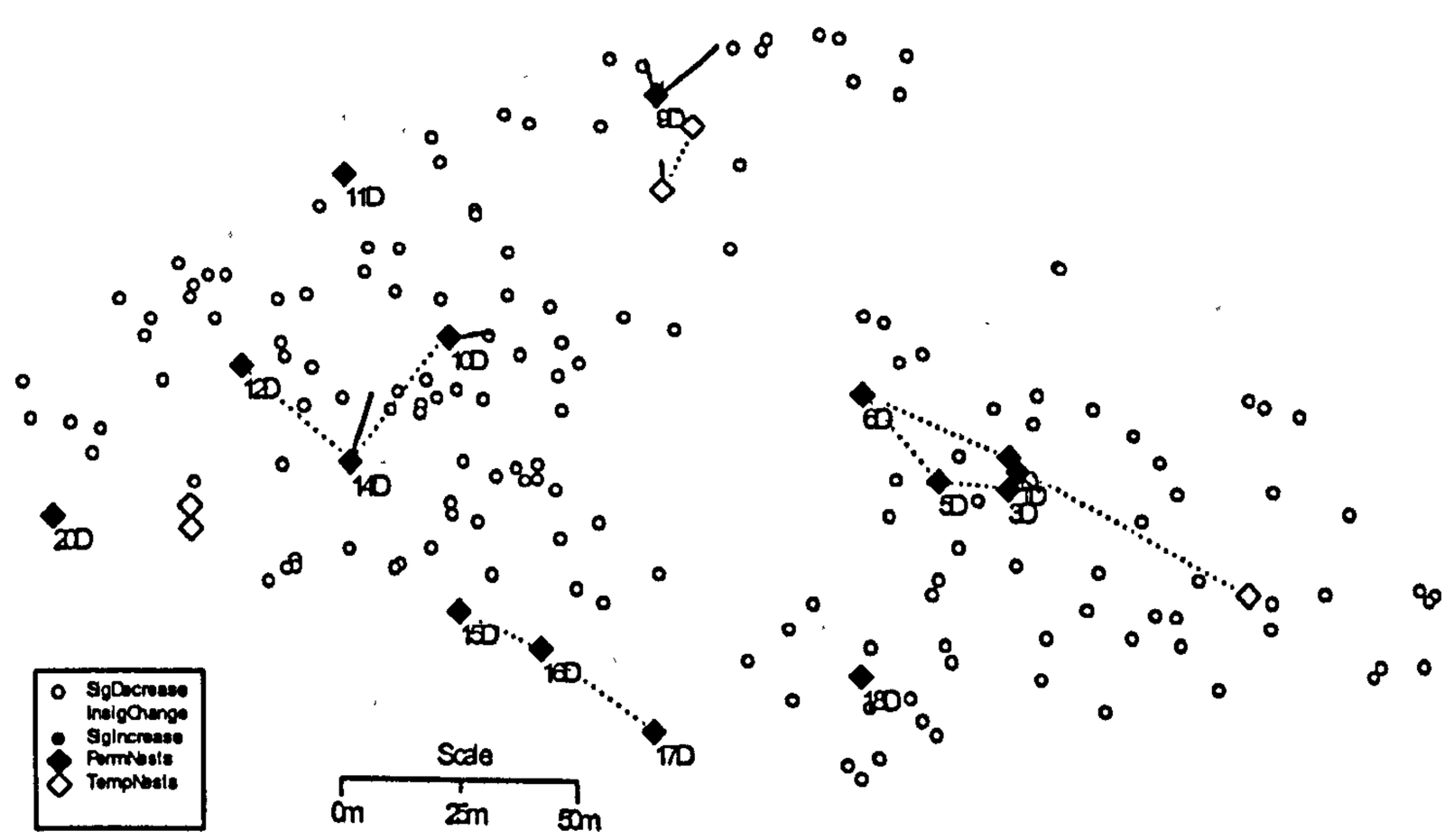
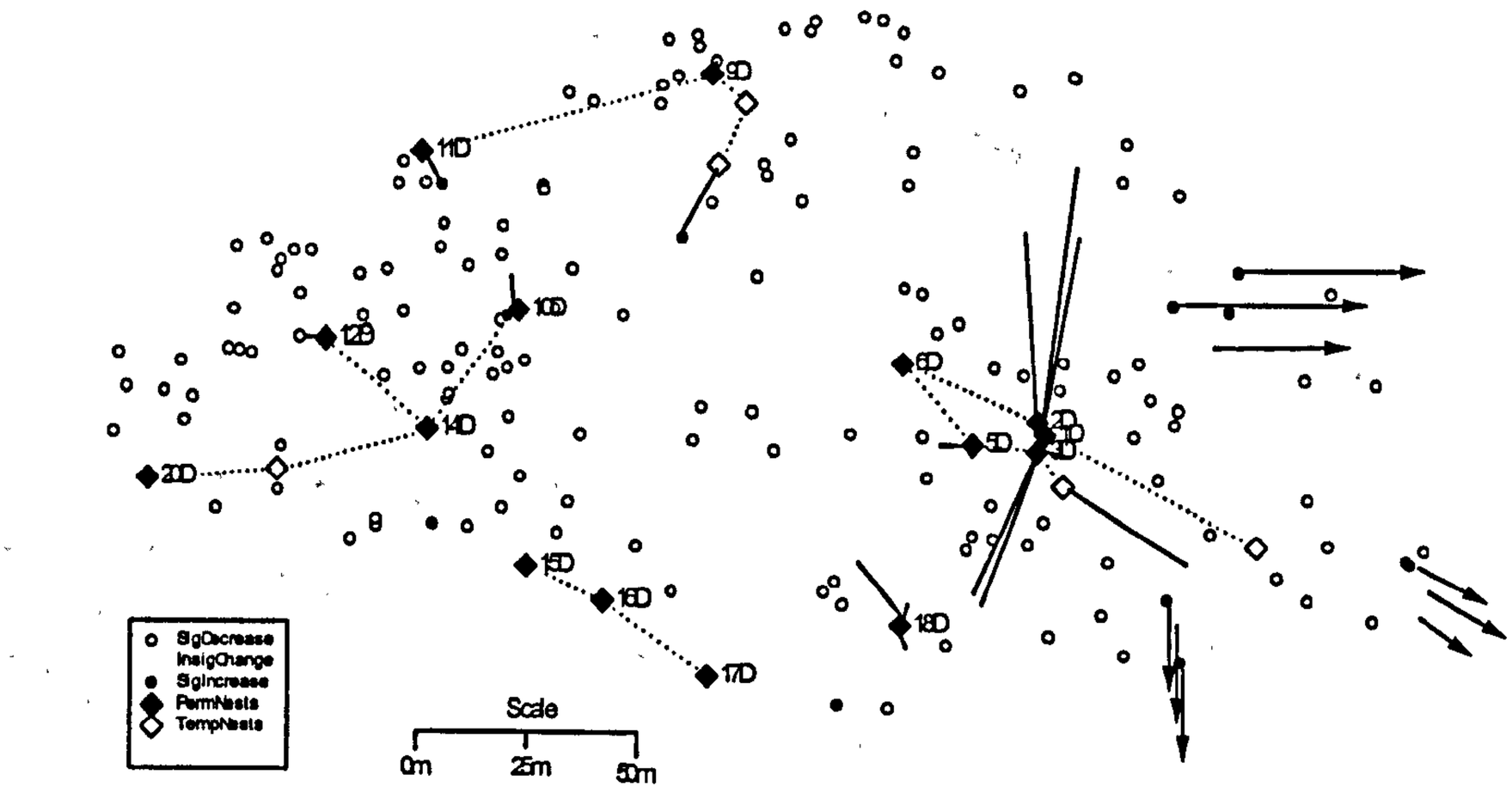


Figure F.6: Difference in foraging activity between adjacent counts for Dimsdale whole site counts a) 17/04/96 with 24/06/96 b) 24/06/96 with 17/04/96

a)



b)

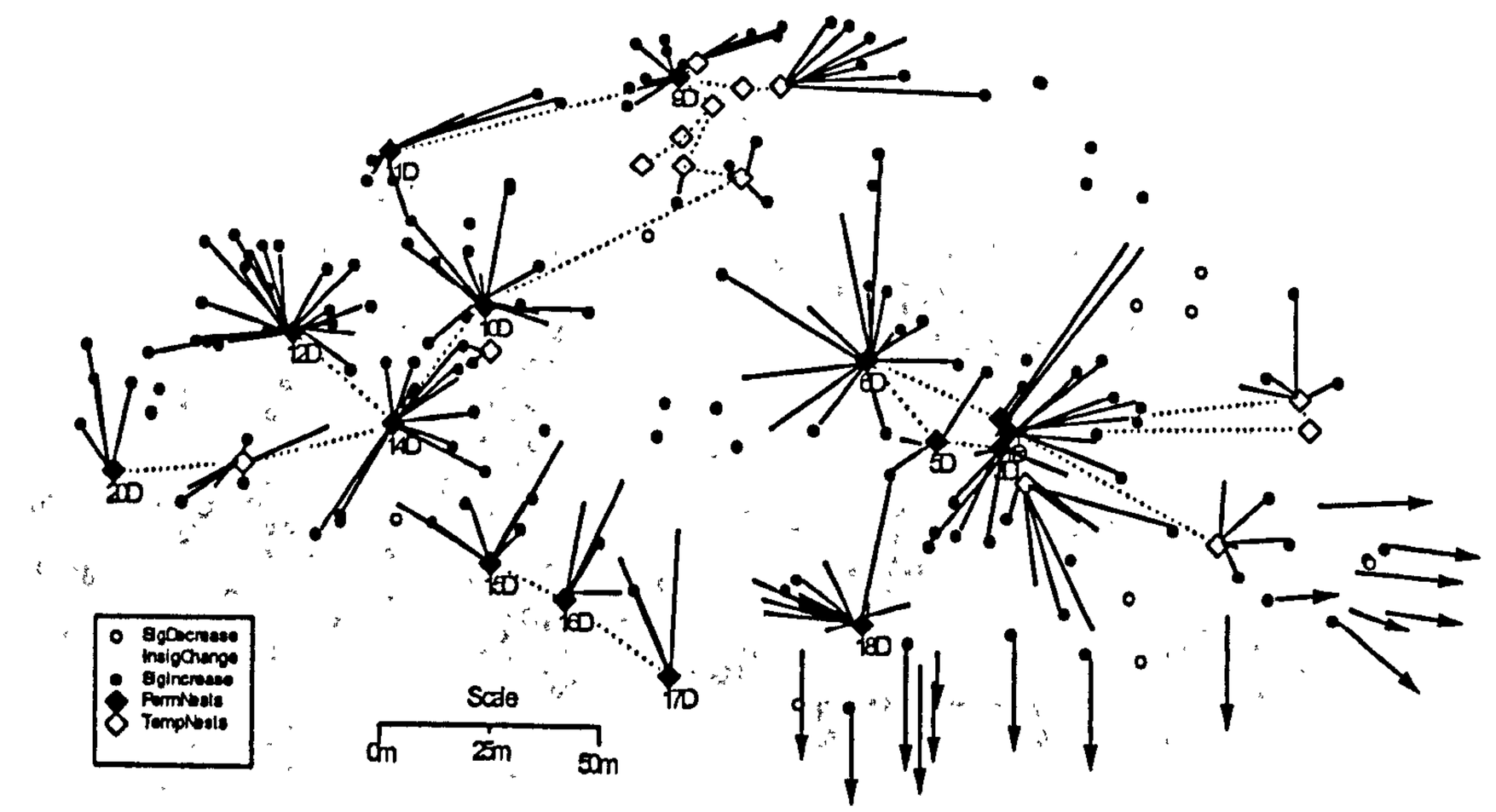
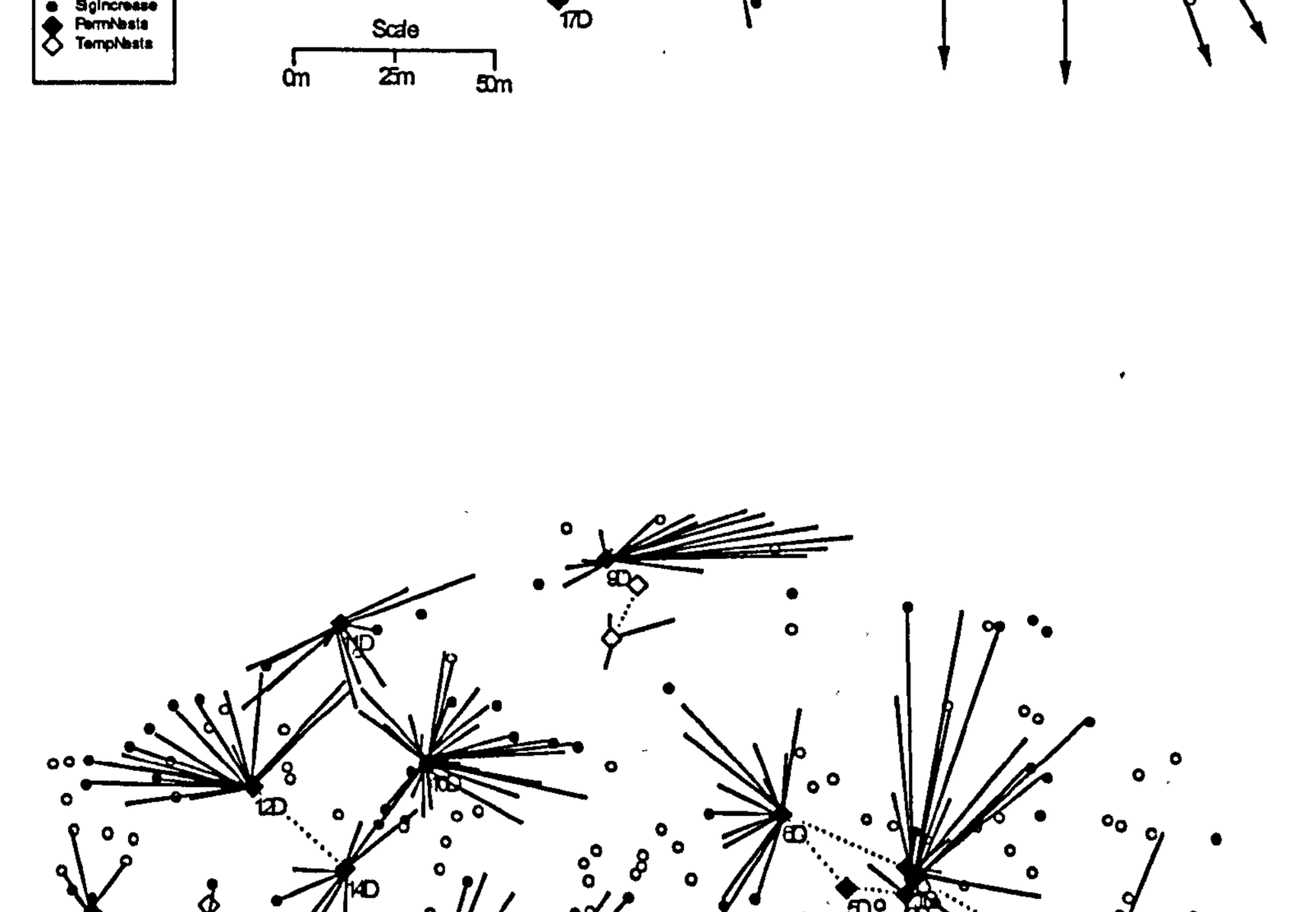


Figure F.7: Difference in foraging activity between different years for Dimsdale whole site counts a) 08/94 with 19/07/95 b) 19/07/95 with 08/94

a)



b)

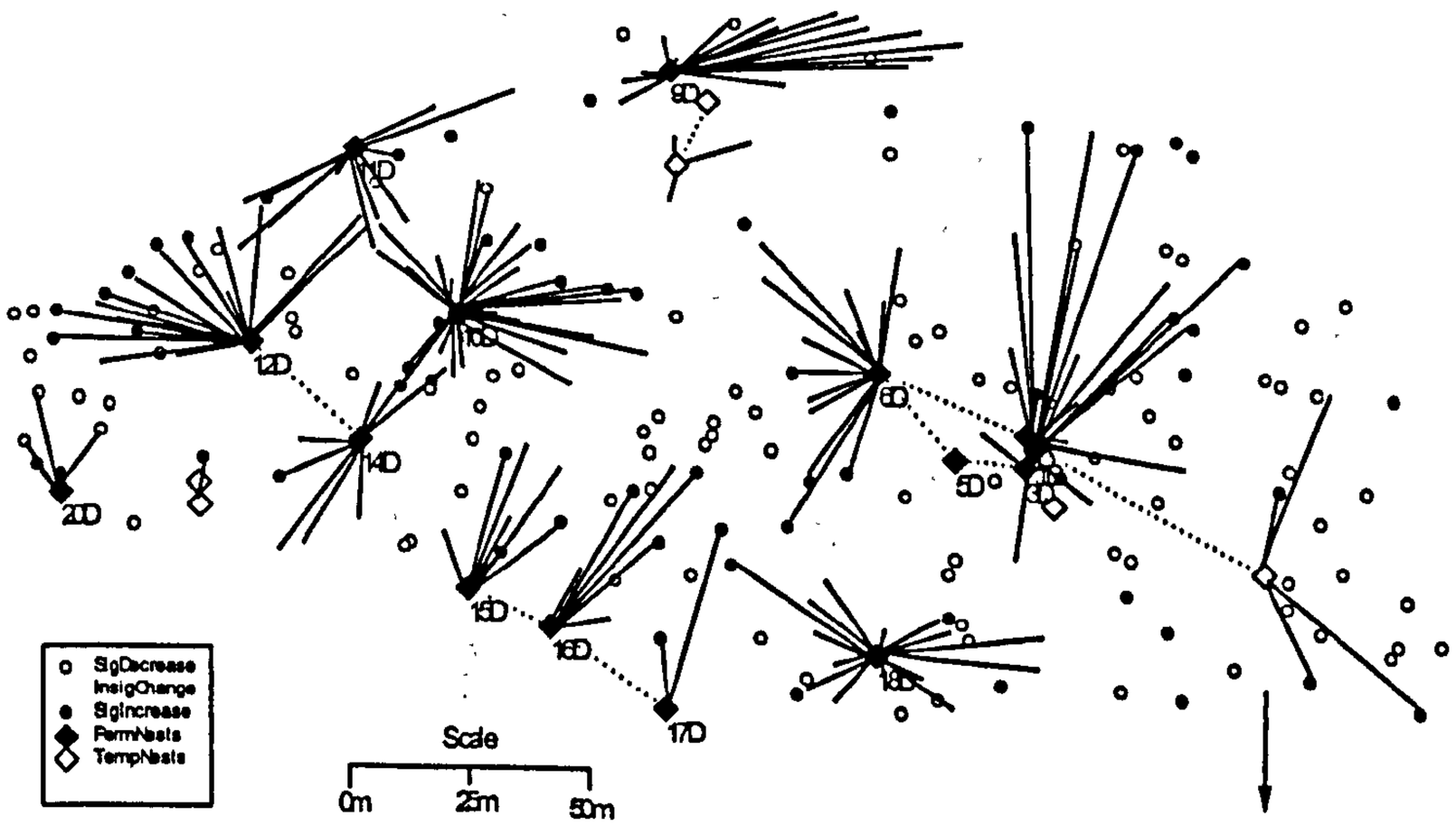
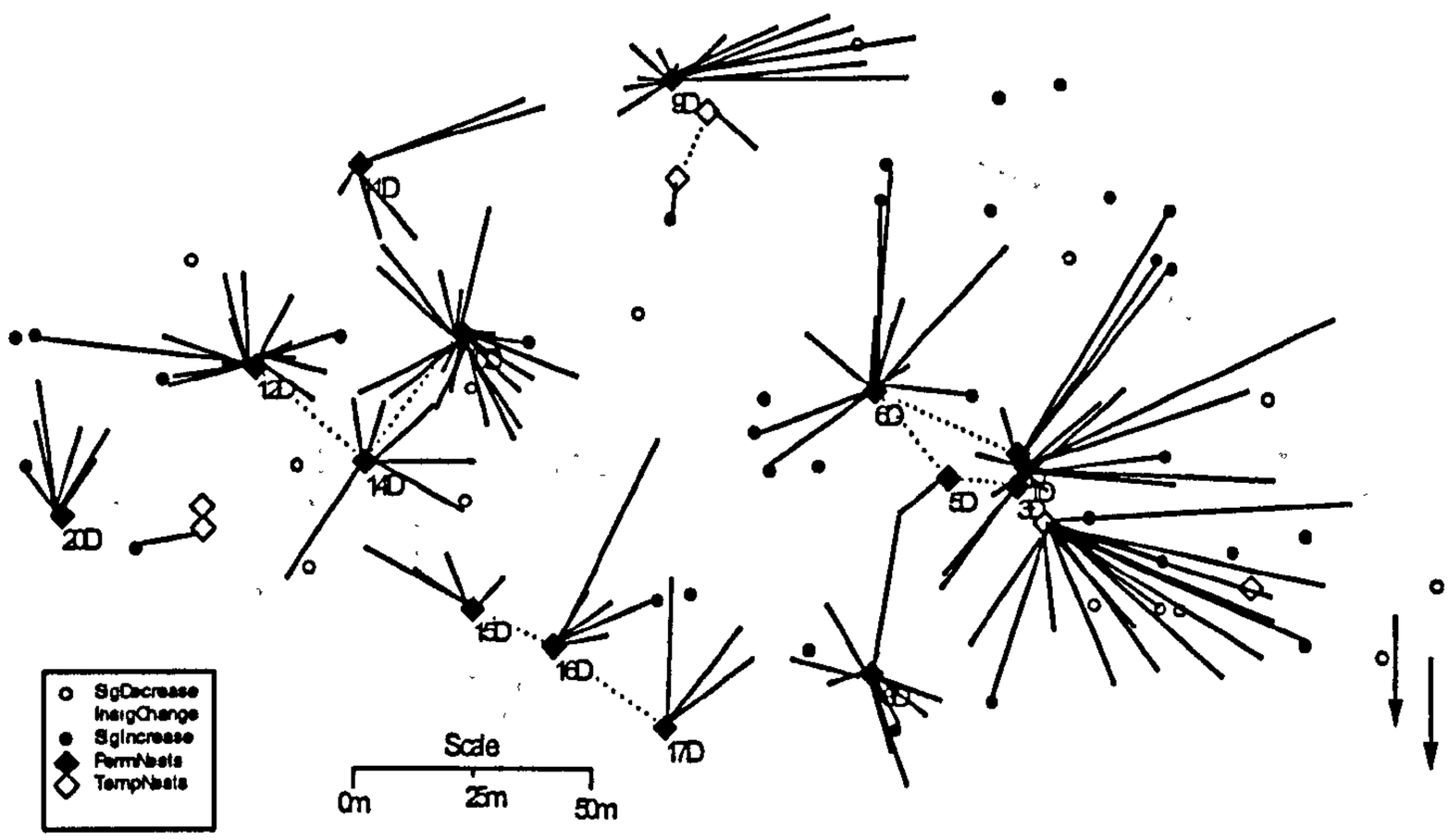


Figure F.8: Difference in foraging activity between different years for Dimsdale whole site counts a) 07/09/94 with 06/09/95 b) 06/09/95 with 07/09/94

a)



b)

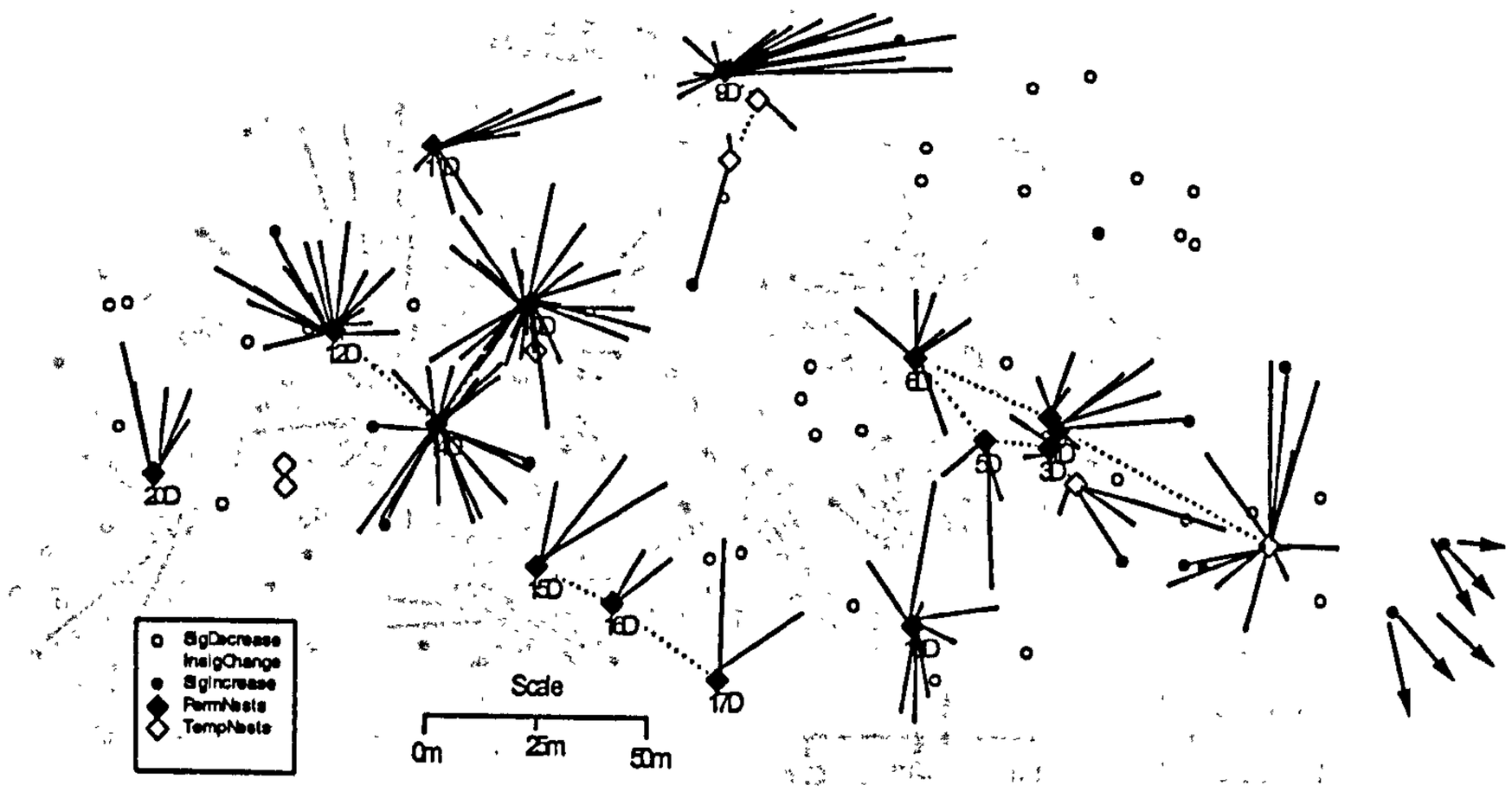
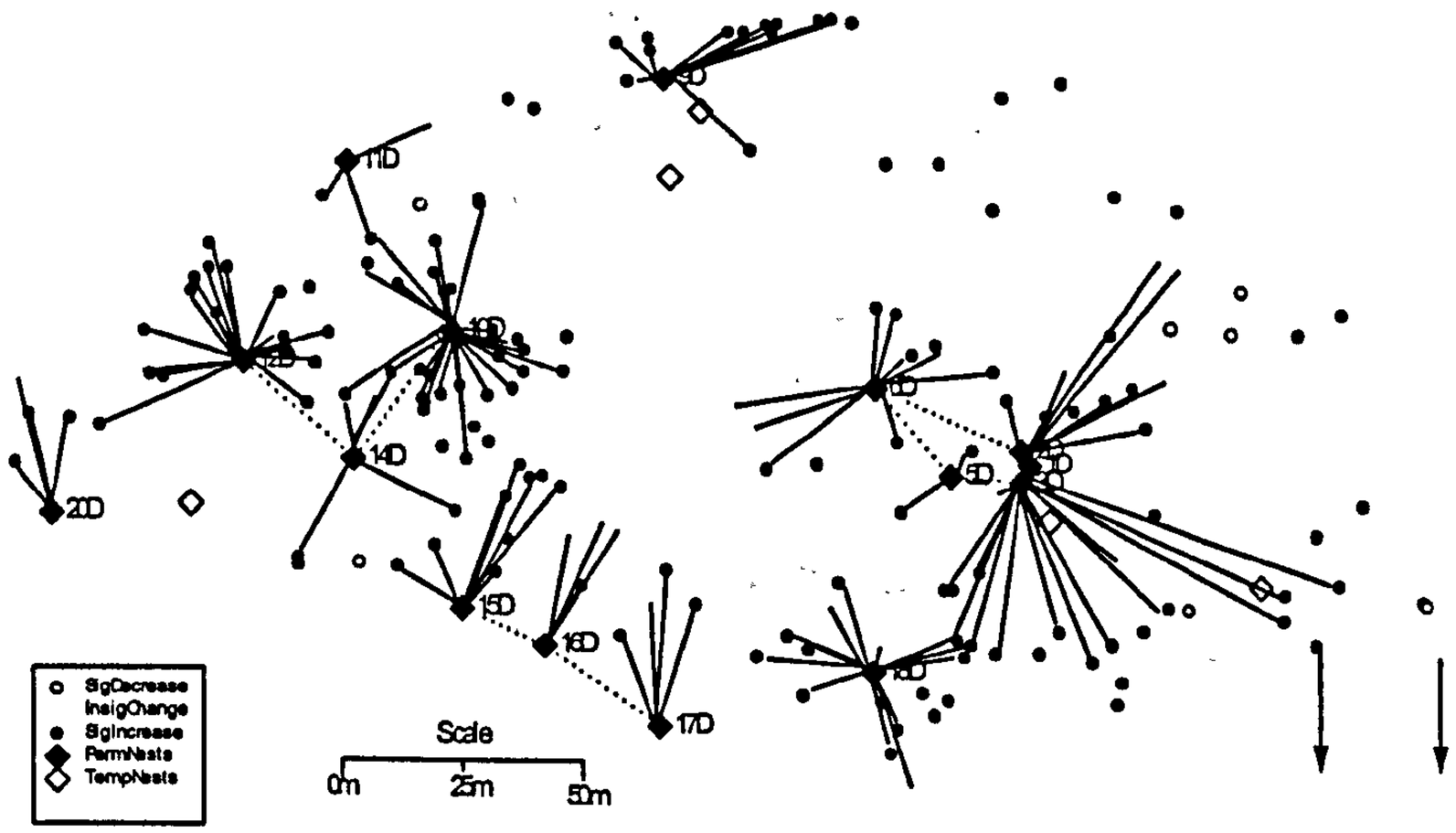


Figure F.9: Difference in foraging activity between different years for Dimsdale whole site counts a) 12/04/95 with 17/04/96 b) 17/04/96 with 12/04/95

a)



b)

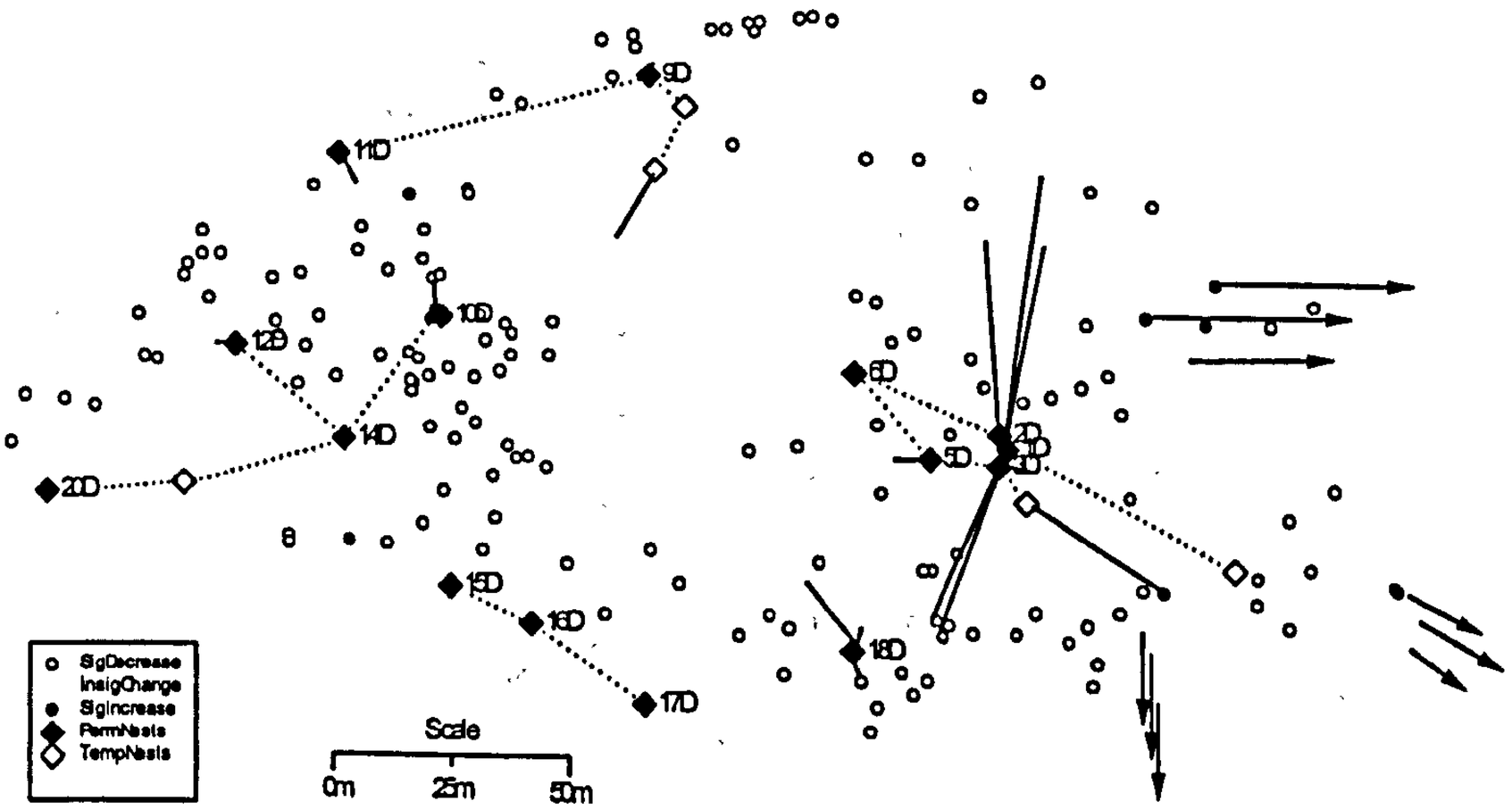
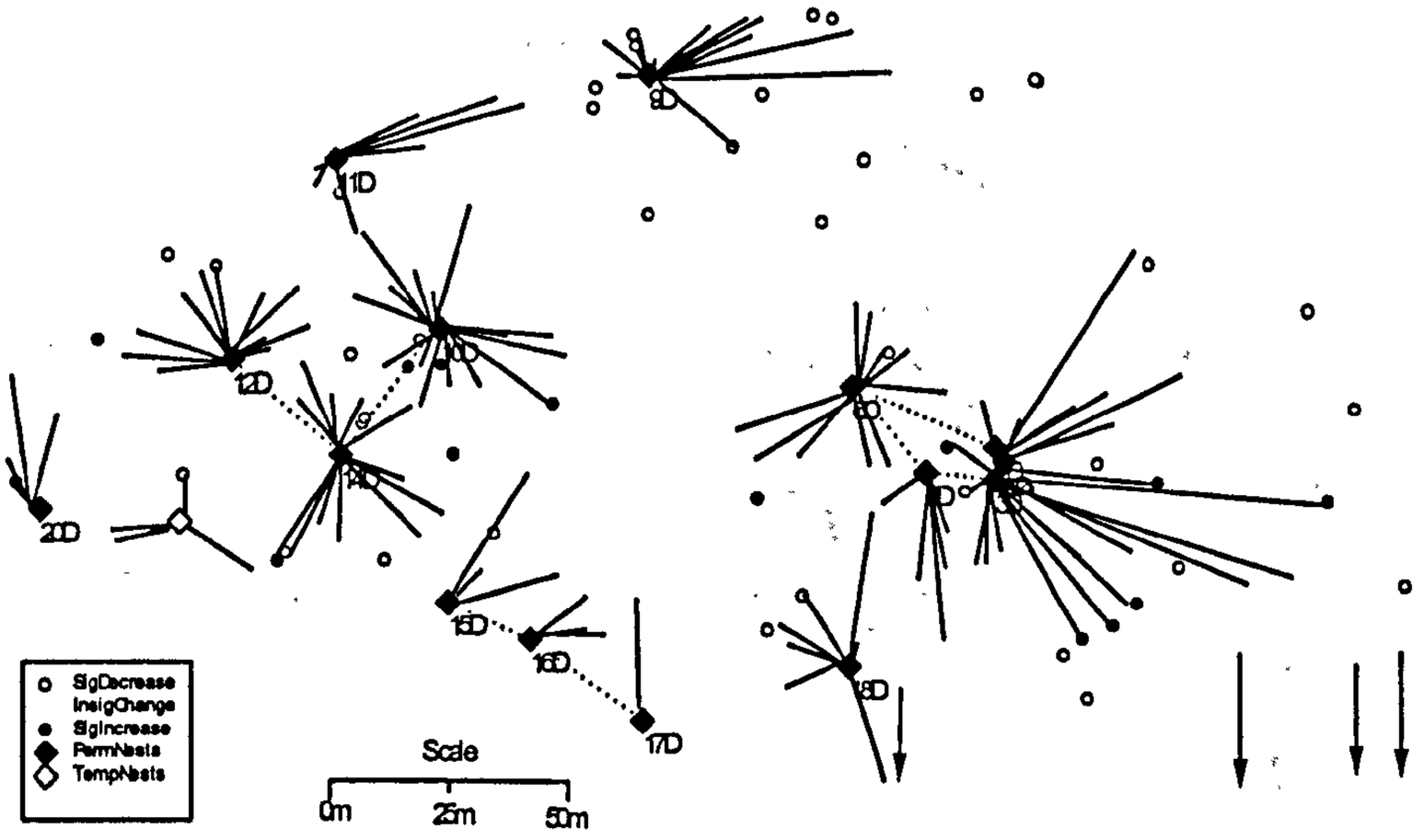


Figure F.10: Difference in foraging activity between different years for Dimsdale whole site counts a) 24/05/95 with 24/06/96 b) 24/06/96 with 24/05/95

a)



b)

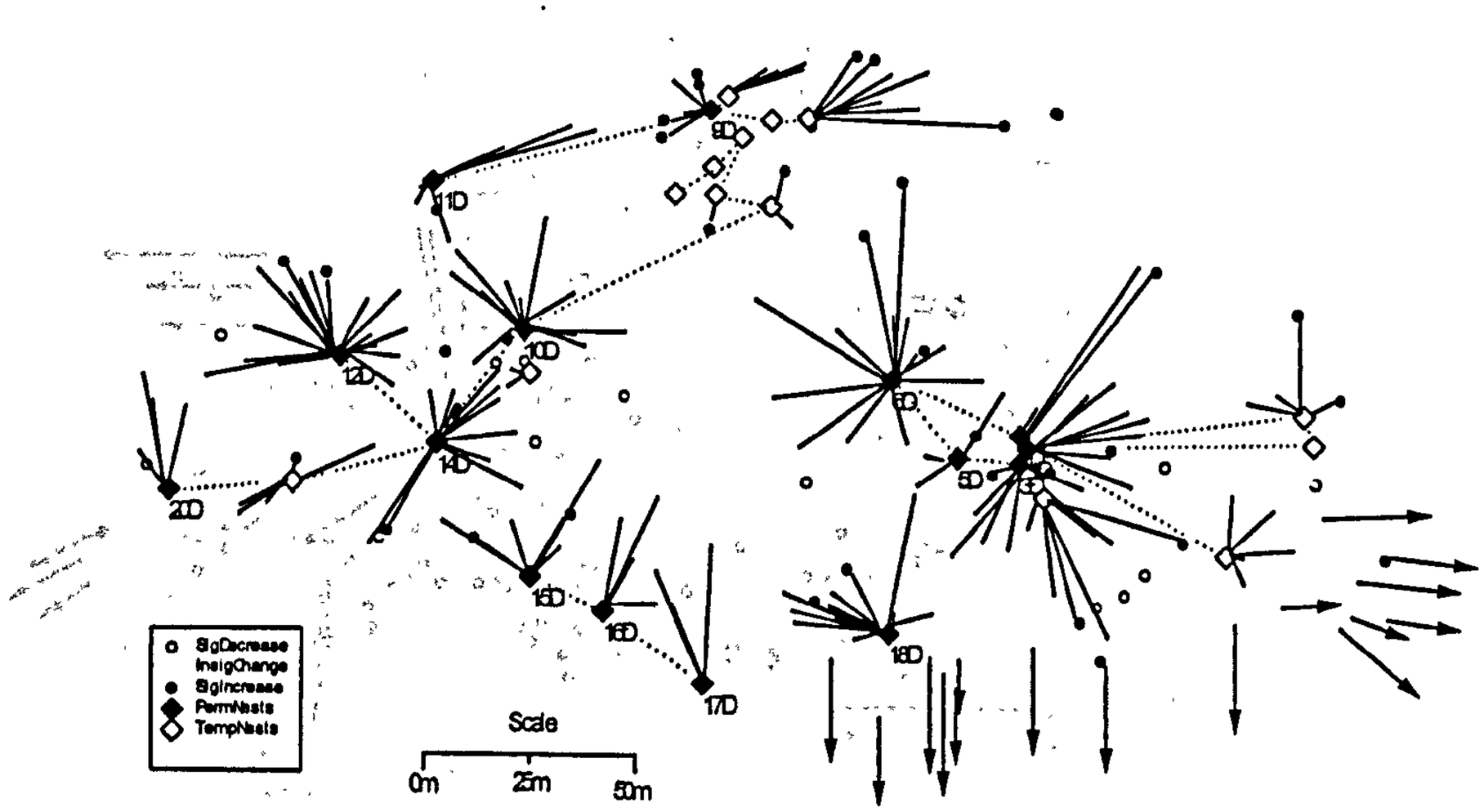
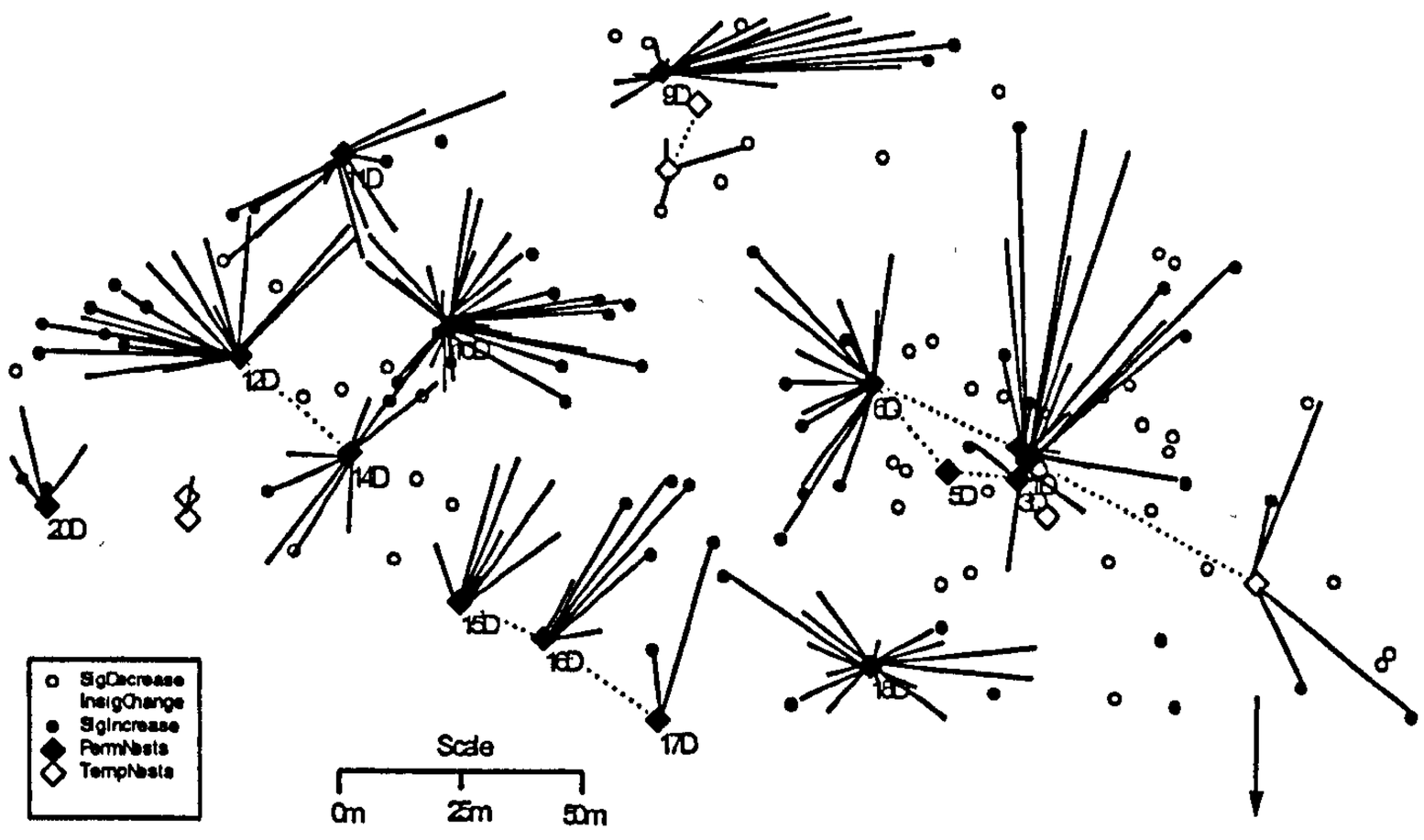


Figure F.11: Difference in foraging activity between different years for Dimsdale whole site counts a) 19/07/95 with 24/06/96 b) 24/06/96 with 19/07/95

a)



b)

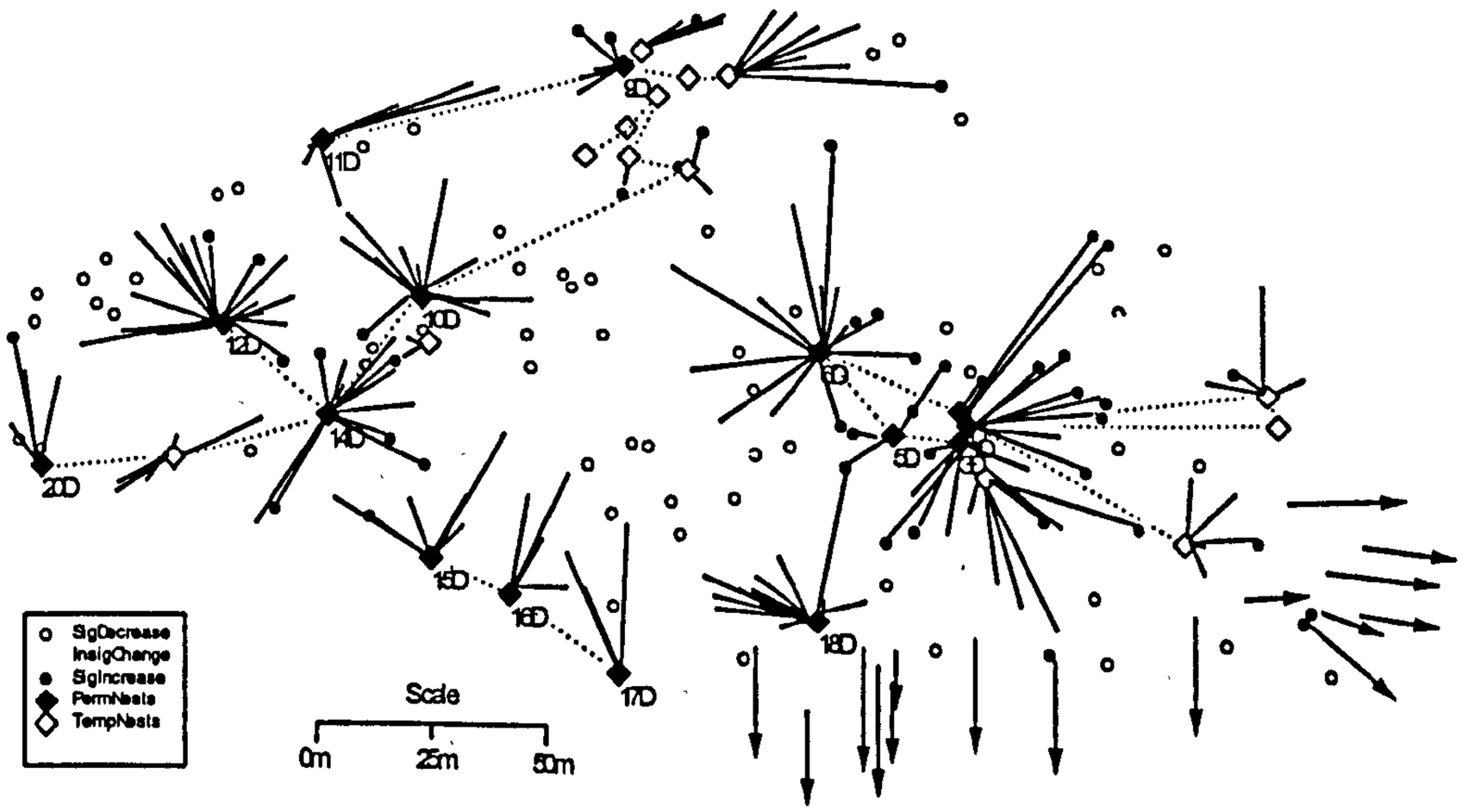
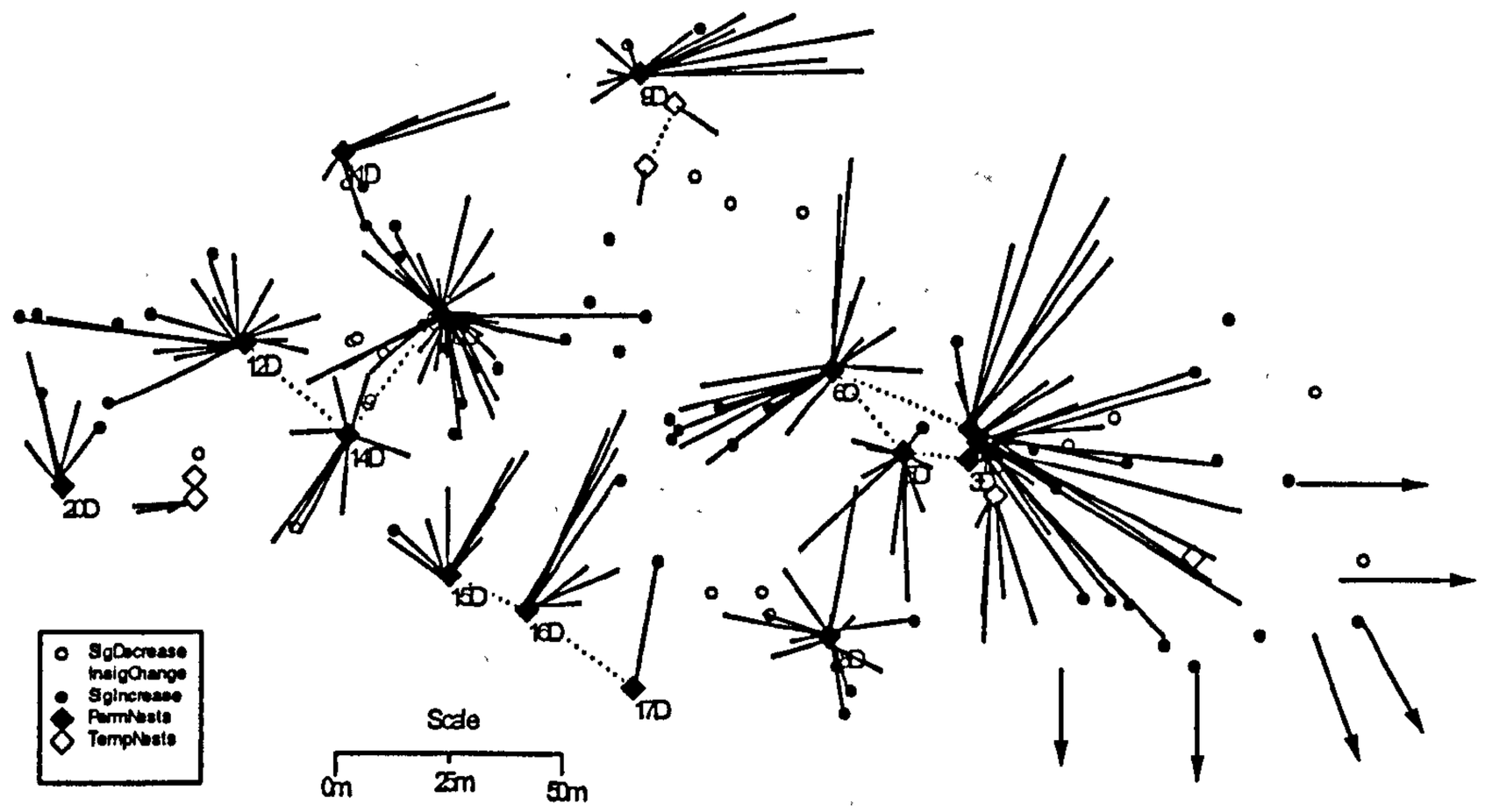
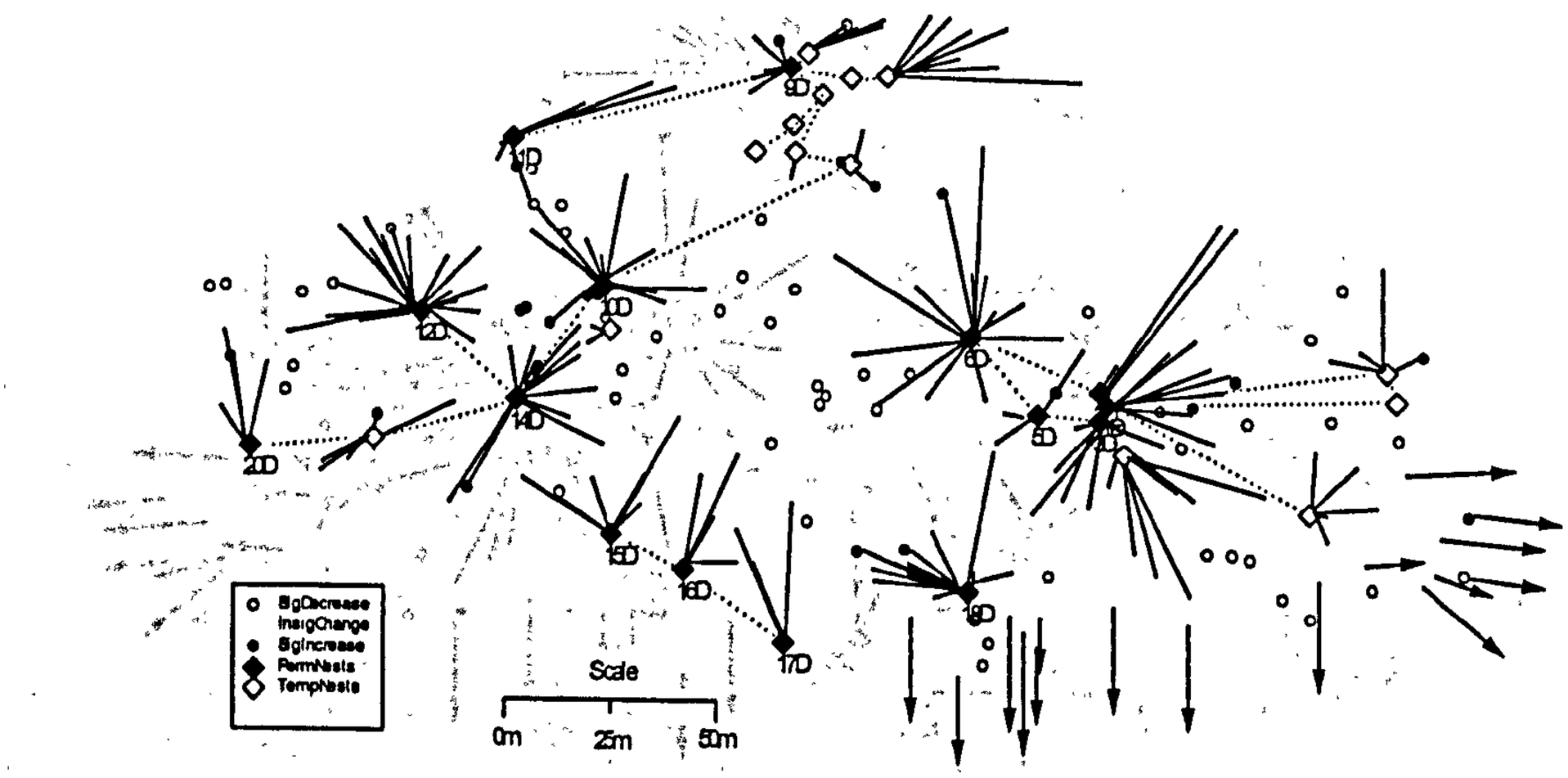


Figure F.12: Difference in foraging activity between different years for Dimsdale whole site counts a) 08/94 with 24/06/96 b) 24/06/96 with 08/94

a)



b)



Appendix G: Foraging counts for Halse (whole site) for 1994 to 1996

Halse, trees outside grids 1 and 2

Tree No.	Species	Girth	Jul-94	16/08/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
1	Oak	2.28	3	1	2	3	1	0	0	1	4
2	Oak	1.2	3	2	0	2	1	0	0	1	3
3	Oak	1.69	4	3	3	3	1	1	0	1	3
4	Beech	0.85	0	0	0	0	1	0	0	1	1
5	Beech	1.12	2	1	1	0	1	1	0	1	1
6	Beech	0.65	1	1	1	1	1	0	0	1	1
7	Beech	2.28	1	2	1	1	2	0	0	1	1
8	Beech	0.26	0	0	0	0	1	0	0	0	0
9	Beech	0.86	1	1	1	1	1	1	0	0	1
10	Oak	0.94	2	3	1	2	2	2	0	1	3
11	Beech	0.82	1	1	0	0	1	1	0	/	0
12	Beech	1.34	1	0	0	0	2	1	0	0	1
13	Group	0.308	0	0	0	0	1	0	0	1	1
14.01	Beech	1.04	1	0	0	1	1	1	0	1	0
14.02	Beech	0.65	0	0	1	0	1	1	0	0	0
14.03	Beech	0.73	1	1	0	0	1	0	0	1	0
15	Beech	1.7	0	0	1	0	2	1	0	0	1
16	Beech	1.42	0	0	1	1	1	0	0	1	0
17	Oak	1.95	3	3	0	1	2	2	0	1	3
18	Beech	1.29	1	1	1	0	1	0	0	1	2
19	Oak	2.09	3	3	3	2	1	2	0	1	3
20	Oak	1.37	1	0	1	0	1	1	0	1	1
21	Beech	0.58	0	1	0	0	1	0	0	0	0
22	Beech	0.83	0	1	0	1	1	0	0	0	0
23	Beech	1.21	1	0	0	0	1	1	0	0	0
24.01	Beech	0.89	0	0	0	0	1	0	0	0	1
24.02	Beech	1.18	0	0	0	0	1	0	0	0	0
25	Oak	1.03	1	0	0	0	1	1	0	0	1
26	Beech	1.14	0	0	0	0	1	0	0	0	0
27.01	Beech	1 56	0	0	0	1	1	0	0	0	0
27.02	Beech	1.82	0	0	0	1	1	0	0	0	0
28.01	Beech	0.7	0	0	0	0	0	0	0	0	0
28.02	Beech	1	0	0	0	1	1	0	0	0	0
29	Beech	1.24	0	0	0	0	0	0	0	0	0
30	Oak	1.57	1	0	0	0	1	0	0	1	1
31	Oak	1.77	0	0	0	0	1	0	0	0	0
32	Oak	1.43	1	2	0	0	0	0	0	1	0
33	Beech	3	0	0	0	0	1	1	0	1	0
34.01	Beech	1.23	0	0	0	0	1	0	0	1	0
34.02	Beech	0.95	0	0	1	0	1	0	0	0	0
35	Oak	1 3	0	0	0	0	1	0	0	0	0
36	Oak	1.04	1	1	0	0	1	1	0	0	1
37	Oak	1.42	1	0	1	0	1	2	0	0	1
38	Beech	1.68	1	0	0	0	1	0	0	0	0
39	Beech	1	0	0	0	1	1	0	0	0	1
40	Oak	1.42	2	2	0	2	2	3	0	0	2
41	Oak	0.88	0	/	1	0	1	1	0	1	1
42	Beech	2.06	1	1	0	0	1	1	0	0	0
43	Beech	1.79	1	0	0	0	1	0	0	0	0
44	Beech	1.03	0	0	0	0	1	0	0	0	0
45.01	Beech	1.2	1	0	0	1	1	1	0	0	0
45.02	Beech	1	0	1	0	1	1	0	0	1	1
46	Oak	1.08	2	2	1	2	2	2	0	0	2
47	Beech	1.25	1	0	1	0	1	1	0	1	0
48	Beech	1.36	1	1	1	0	0	0	0	0	0
49	Beech	1.32	1	0	0	0	1	0	0	0	0
50	Beech	1.24	1	1	0	0	1	1	0	1	0
51	Oak	2.53	2	3	2	2	2	3	0	0	2
52	Beech	0.73	0	0	1	0	1	0	0	1	1
53	Beech	1.55	1	0	1	1	1	0	0	0	0
54	Beech	1.38	1	0	1	0	1	0	0	0	0
55	Beech	1.53	0	0	0	1	1	0	0	0	0
56	Beech	0.84	0	0	0	0	1	0	0	1	0

Tree No.	Species	Girth	Jul-94	16/08/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
57	Beech	0.96	0	0	0	0	1	0	0	1	1
58	Beech	0.88	0	0	0	0	1	0	0	1	0
59	Beech	0.76	1	1	0	0	1	0	0	0	0
60	Beech	3.11	0	0	0	0	1	0	0	0	0
61.01	Beech	0.95	1	0	0	1	1	0	0	1	1
61.02	Beech	1.19	0	0	0	0	1	1	0	0	0
62	Beech	1.69	1	2	1	0	2	1	0	2	1
63	Beech	1.85	1	1	0	1	3	0	1	1	1
64	Beech	1.39	1	2	1	1	2	0	0	1	0
65	Beech	0.39	1	0	0	0	1	0	0	0	1
66	Beech	1.4	1	1	0	1	2	1	2	2	2
67	Beech	0.62	1	0	0	1	2	1	1	2	1
68	Beech	1.05	2	1	1	0	3	0	0	1	1
69	Beech	1.65	1	0	1	1	2	0	0	2	2
70	Beech	0.56	2	1	1	0	1	0	0	1	0
71	Beech	1.89	1	1	1	0	2	0	0	2	1
72	Oak	2.32	4	4	3	3	2	2	2	3	2
73	Beech	1.19	1	1	0	0	1	0	0	1	1
74	Beech	1.25	0	0	1	0	2	0	0	2	1
75	Silver birch	0.25	0	0	0	1	1	0	0	1	1
76	Beech	1.77	0	0	1	1	1	0	0	1	1
77	Beech	1.56	1	1	2	0	2	1	0	1	0
78	Oak	1.28	3	3	3	2	1	2	0	1	2
79.01	Beech	0.52	1	0	0	0	1	0	0	0	1
79.02	Beech	1.34	1	1	0	1	1	1	0	1	1
79.03	Beech	0.73	1	1	0	0	1	0	0	1	0
79.04	Beech	0.66	0	1	0	1	1	0	1	1	1
79.05	Beech	0.82	0	1	0	1	1	1	0	0	0
79.06	Beech	0.52	1	0	0	1	1	0	0	0	0
80	Beech	1.29	1	1	1	1	1	1	0	2	0
81	Oak	1	4	3	2	2	1	3	2	1	3
82	Beech	1.67	1	1	0	1	1	1	0	1	1
83	Beech	1.18	0	0	0	0	1	0	0	1	1
84	Beech	1.27	1	0	1	1	1	0	0	1	0
85	Beech	1.54	1	1	0	0	1	0	0	1	0
86	Beech	3 87	1	1	1	1	1	1	0	2	0
87	Beech	2.41	1	1	0	1	1	0	0	0	0
88	Beech	1.06	1	0	0	0	1	0	0	0	0
89	Beech	duplicate 53									
90	Beech	1.7	1	0	1	0	1	0	0	0	1
91	Beech	0.72	1	1	0	0	1	0	1	1	0
92	Beech	1.44	1	1	0	0	1	0	0	1	1
93	Beech	1.4	1	0	0	0	1	0	0	0	0
94	Beech	1.34	0	1	1	0	2	0	0	1	1
95	Oak	2.22	4	4	2	3	1	3	0	1	3
96	Oak	1.9	3	3	2	2	1	2	1	1	3
97	Beech	1.6	1	2	0	3	1	0	0	1	1
98.01	Beech	1.37	0	0	0	1	2	0	0	0	1
98.02	Beech	1.39	0	0	1	1	2	0	1	1	1
99	Oak	1.42	2	2	2	2	2	2	0	0	3
100	Beech	1.64	1	1	1	0	2	0	0	1	1
101.01	Beech	1.63	1	1	1	1	1	0	0	0	0
101.02	Beech	0.73	0	0	1	0	1	0	0	0	0
102	Oak	0.9	3	2	3	1	1	0	0	0	1
103	Beech	0.6	1	0	2	0	1	0	0	0	0
104	Beech	1.67	1	0	1	1	1	0	0	0	0
105	Beech	1.4	1	1	0	0	1	0	0	0	0
106	Beech	1.42	0	0	0	0	1	0	0	0	1
107	Beech	1.76	0	0	1	1	2	0	0	1	1
108	Beech	2.01	1	0	1	0	2	0	0	0	1
109	Oak	0.61	1	0	0	0	1	0	0	0	0
110	Oak	1.3	3	3	3	2	1	0	0	0	1
111	Oak	0.86	2	2	2	1	1	0	0	1	1
112	Oak	0.95	1	2	2	1	2	2	0	0	1
113.01	Beech	0.69	1	0	0	1	0	0	0	0	1
113.02	Beech	1.49	1	1	2	1	0	1	0	1	1
113.03	Beech	0.61	0	0	1	1	1	0	0	1	0
114	Beech	1.42	1	1	1	1	2	1	0	0	0

Tree No.	Species	Girth	Jul-94	16/08/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
115	Oak	1.46	3	3	3	1	2	2	0	1	1
116	Oak	1.19	/	1	2	1	1	1	0	0	2
117	Silver birch	0.31	0	1	1	0	1	0	0	0	0
118	Group	0.162	0	0	0	1	1	0	0	0	0
119	Oak	1.47	2	1	1	2	2	2	0	1	2
120	Group	0.55	1	0	0	1	1	0	0	0	0
121	Oak	0.94	1	1	3	0	0	0	0	0	0
122	Oak	1.12	3	2	3	1	1	0	0	0	0
123	Oak	1.2	1	2	3	0	0	0	0	0	0
124	Oak	1.52	4	3	3	0	0	1	0	0	0
125	Silver birch	0.21	0	0	0	0	1	0	0	1	0
126	Oak	1.2	3	3	3	1	1	0	0	0	0
127	Oak	1.42	3	2	2	1	1	2	0	1	2
128	Group	0.1	0	0	0	0	0	0	0	0	0
129	Oak	1.21	3	2	3	0	1	1	0	0	0
145	Beech	1.68	2	2	1	2	3	3	0	1	2
146	Group	0.222	0	1	0	0	0	0	0	1	1
147	Oak	1.39	3	1	0	1	2	1	0	1	2
148.01	Beech	1.41	0	1	0	0	1	0	0	1	1
148.02	Beech	1.3	1	0	1	0	1	1	0	1	1
148.03	Beech	0.74	0	0	1	0	1	0	0	1	1
149	Oak	1.25	4	3	2	1	1	2	0	1	3
150	Beech	0.15	0	0	0	0	0	0	0	1	0
151	Beech	0.25	0	0	1	0	/	0	0	1	0
152	Group	0.15	0	0	0	0	0	0	0	1	0
153	Group	0.15	0	0	0	0	0	0	0	1	0
154	Beech	1.82	2	2	2	0	1	1	1	1	1
155	Beech	1.3	2	2	0	0	1	0	0	1	0
156	Silver birch	1.38	3	1	2	0	1	1	1	2	1
157	Oak	0.23	0	1	1	0	1	0	0	1	1
158	Oak	0.95	3	2	2	1	2	1	0	2	3
159	Oak	1.5	3	3	3	2	2	3	0	2	3
160	Oak	0.89	2	2	2	1	2	0	0	2	3
161	Oak	0.46	2	1	1	0	1	0	0	1	1
162	Oak	1.14	3	3	/	2	2	3	0	1	3
163	Oak	1.19	4	2	2	2	2	3	0	2	3
164	Silver birch	1.04	2	1	2	1	1	1	0	2	0
165	Beech	1.84	1	1	1	1	2	2	0	2	1
166	Oak	1.06	3	2	1	2	1	2	0	1	2
167	Oak	0.78	3	2	3	1	1	2	0	2	2
168	Oak	1.88	4	3	3	2	2	2	0	3	3
169	Oak	1.35	3	2	3	1	1	1	0	2	1
170	Oak	1.14	3	2	3	2	1	1	1	1	2
171	Oak	1.54	3	2	2	1	1	1	0	1	1
172	Oak	1.61	3	2	2	2	2	1	0	5	3
173	Beech	1.1	0	0	1	0	1	1	0	0	1
174	Beech	1.92	1	0	1	1	1	0	0	1	1
175	Oak	2.07	2	2	2	1	1	2	0	1	1
176	Oak	2.76	5	3	4	1	1	3	0	1	3
177	Beech	1.34	0	0	1	1	1	1	0	1	1
178	Beech	1.78	1	0	1	1	2	0	0	1	0
179	Beech	1.65	1	0	0	0	1	0	0	1	0
180	Oak	1.74	1	1	1	0	1	1	0	0	1
181	Beech	1.19	1	0	0	0	1	0	0	1	0
182	Oak	1.75	2	1	2	0	1	1	0	0	1
183	Oak	1.19	2	2	1	1	2	2	0	1	1
184.01	Beech	0.93	0	1	1	0	3	2	0	0	0
184.02	Beech	0.63	0	1	0	0	3	1	0	0	0
185	Beech	2.02	0	1	1	0	3	1	0	0	0
186	Oak	1.57	3	2	1	1	1	3	0	0	1
187	Group	0.2	1	1	0	0	1	0	0	1	0
188	Oak	0.84	0	1	1	1	1	0	0	1	2
189	Oak	0.68	1	0	1	1	0	0	0	1	1
190	Oak	0.8	1	1	2	1	1	0	0	0	3
191	Silver birch	1.07	1	0	0	0	1	0	0	3	1
192	Silver birch	0.66	1	0	0	0	1	1	0	2	0
193	*Prunus* sp.	0.2	0	0	1	0	1	0	0	0	0
194	Oak	0.71	2	1	1	0	1	1	0	1	0

Tree No.	Species	Girth	Jul-94	16/08/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
195	Oak	1.59	3	2	1	1	1	1	0	1	3
196	Oak	0.82	1	0	1	1	1	0	0	1	2
197	Oak	1.39	2	1	3	1	2	1	0	1	3
198	Oak	3.58	2	1	0	0	0	1	0	0	0
199	Beech	1.3	0	0	1	0	1	1	0	0	0
200	Beech	1.65	1	1	1	0	1	1	0	1	0
201	Oak	1.54	4	4	4	3	2	1	0	3	3
202	Oak	1.3	4	/	4	3	2	2	1	2	3
203	Oak	2.48	4	2	5	3	2	3	1	3	2
204	Oak	1.9	4	2	4	3	2	3	0	3	2
205	Oak	1.47	4	3	2	2	3	1	1	1	2
206	Whitebeam	0.3	0	0	1	0	1	0	0	1	0
207	Silver birch	0.32	0	0	1	1	1	0	0	1	0
208	Group	0.2	1	0	0	1	1	1	0	1	0
209	Beech	0.8	0	0	0	1	2	1	0	1	0
210	Silver birch	1.43	1	1	1	1	1	1	0	2	1
211	Beech	0.56	0	0	0	1	2	0	0	1	0
212	Beech	0.69	0	1	1	1	2	1	0	1	0
213	Beech	0.73	1	0	1	1	2	0	0	1	0
214	Oak	0.63	2	1	1	2	1	1	0	1	2
215	Silver birch	0.88	1	0	1	1	1	0	0	2	0
216	Beech	0.56	0	0	1	1	2	1	0	1	0
217	Beech	0.8	0	1	1	1	3	2	1	1	2
218	Silver birch	0.89	1	1	1	2	1	0	0	2	1
219	Silver birch	0.48	1	1	1	1	1	1	0	2	0
220	Silver birch	1.6	1	1	1	1	2	0	0	2	2
221	Silver birch	0.76	0	1	1	1	0	0	0	1	1
222	Silver birch	0.75	1	0	0	0	1	0	0	2	0
223	Silver birch	0.83	0	0	0	2	1	0	0	2	0
224	Oak	0.56	1	0	1	1	2	1	0	2	2
225	Oak	1.2	3	3	2	3	1	3	0	1	3
226	Beech	2.41	1	1	1	1	2	1	0	1	1
227	Beech	2.42	1	1	1	0	2	1	0	1	1
228	Beech	2.65	1	1	1	1	2	1	0	1	0
229	Group	0.175	1	0	0	0	1	1	0	1	0
230	Beech	5.02	2	0	1	1	1	2	0	1	1
231	Oak	1.29	3	2	2	1	3	3	0	0	2
232	Beech	2.2	1	0	1	1	1	1	0	0	0
233	Beech	2.5	1	0	1	1	1	0	0	0	0
234	Beech	1.6	0	0	1	1	2	0	0	0	1
235	Beech	0.17	0	0	0	1	0	/	0	0	0
236	Beech	2.25	1	1	1	1	1	0	0	0	0
237	Beech	3.68	1	1	1	1	1	0	0	1	1
238	Beech	0.7	0	0	0	0	1	0	0	0	0
239	Beech	0.9	0	0	1	1	0	0	0	0	0
240	Silver birch	1.2	0	0	0	0	0	0	0	2	0
241.01	Beech	1.96	0	0	1	0	2	0	0	0	0
241.02	Beech	1.57	0	0	0	0	2	1	0	0	0
242	Oak	1.4	3	2	1	1	1	2	0	0	1
243	Silver birch	0.92	1	1	1	0	0	0	0	1	0
244	Whitebeam	0.29	0	0	1	0	1	0	0	1	0
245	Silver birch	0.38	1	1	1	0	1	0	0	3	1
246	Oak	1.69	/	3	4	2	3	0	0	1	3
247	Group	0.2	1	0	1	1	0	0	0	1	0
248	?	0.5	0	0	/	0	1	0	0	/	0
249	Group	0.1	0	1	0	0	1	0	0	0	1
250	Oak	1.41	4	3	3	1	1	2	0	1	2
251	Oak	0.65	1	1	1	1	1	0	0	1	1
252	Oak	2.48	3	3	3	3	1	1	0	1	3
253	Beech	1.63	0	0	1	0	3	1	0	0	1
254	Beech	2.16	1	0	1	1	2	0	0	1	0
255	Group	0.2	1	0	0	1	1	0	0	1	0
256	Beech	1.52	1	1	1	1	1	0	0	1	1
257	Beech	0.58	1	0	1	0	0	/	0	0	1
257.1	Group	0.1	1	0	0	0	0	0	0	1	0
258	Beech	1.99	0	1	0	1	2	0	0	1	0
259	Oak	1.16	3	2	1	2	1	2	0	0	1
260	Oak	0.69	1	0	1	1	3	2	0	0	3

Tree No.	Species	Girth	Jul-94	16/08/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
261	Oak	0.57	1	0	1	1	2	2	0	0	1
262	Oak	0.75	1	0	1	2	0	0	0	1	1
263	Oak	0.39	1	0	1	1	1	0	0	0	1
264	Oak	1.37	3	2	2	3	3	2	0	1	2
265	Oak	0.91	1	1	1	1	0	0	0	0	1
266	Beech	1.75	1	0	1	1	2	0	0	1	0
267	Oak	1.78	4	3	2	1	2	3	1	1	3
268	Beech	1.61	1	1	1	1	2	1	0	0	0
269	Group	0.6	0	1	0	1	2	0	0	0	0
270	Beech	0.17	0	0	0	1	1	0	0	0	0
271	Beech	1.92	1	1	1	1	2	0	0	0	0
272	Oak	0.42	0	0	0	0	0	0	0	0	0
273	Beech	2.29	1	1	1	0	3	1	0	0	1
274	Beech	1.01	0	1	1	0	1	2	0	1	0
275	Oak	0.96	1	0	2	2	1	0	0	1	2
275.01	Beech	0.5	1	1	0	/	2	0	0	1	1
275.02	Beech	0.78	/	/	0	/	/	0	0	1	1
276.01	Beech	0.92	/	0	0	1	2	0	0	0	0
276 02	Beech	1.15	/	0	0	1	2	0	0	0	0
277.01	Beech	1.6	3	2	1	0	3	1	0	1	0
277.02	Beech	1.16	2	2	0	0	2	1	0	1	0
278	Beech	1.98	1	2	1	0	1	0	0	0	0
279	Group	0.38	1	0	1	0	1	0	0	1	0
280	Beech	1.37	2	1	1	0	1	1	0	0	2
281	Oak	1.9	4	3	1	4	2	2	1	1	3
282	Beech	not mapped									
283	Oak	0.92	/	0	0	1	1	0	0	0	0
286	Oak	1.48	/	4	4	2	2	3	0	1	3
287	Oak	1.61	/	1	3	3	2	3	1	1	3
288	Silver birch	1.21	/	1	4	3	3	0	0	3	1
289	Oak	2.05	/	3	2	3	2	3	2	2	3
290	Oak	1.3	/	3	2	2	2	2	0	0	3
291	Oak	2.05	/	1	0	2	1	1	0	1	1
292	Beech	2.5	/	0	1	0	2	1	0	1	2
293	Silver birch	0.85	/	0	0	0	0	0	0	2	0
294	Beech	0.5	/	0	1	0	1	0	1	1	0
295	Beech	0.6	/	1	1	0	0	0	0	1	1
296	Beech	1.55	/	2	1	0	3	2	0	2	1
298.01	Silver birch	0.95	/	1	0	1	1	0	0	2	0
298.02	Silver birch	0.55	/	1	0	0	1	0	0	2	0
299	Beech	1.97	/	2	1	0	2	2	1	2	1
300	Beech	1.4	/	1	1	1	3	1	0	2	1
301	Silver birch	1.01	/	1	1	0	0	0	0	1	0
302	Oak	0.91	/	1	1	1	1	0	1	0	2
303	Beech	2.24	/	1	1	1	3	0	0	1	1
304	Oak	2.26	/	3	3	3	4	3	1	0	3
305	Oak	2.13	/	3	2	2	2	3	0	1	3
306	Group	0.23	/	0	1	0	1	0	0	1	0
307	Mountain ash	0.8	/	1	2	1	1	0	0	0	1
308	Beech	0.85	/	0	0	1	2	0	0	0	0
309	Oak	1.05	/	0	1	0	0	0	0	1	0
310	Silver birch	1.05	/	0	1	1	1	1	0	2	1
311	Oak	1.25	/	2	2	2	1	2	1	1	1
312	Whitebeam	1.2	/	0	0	1	0	1	0	0	1
313	Oak	0.5	/	0	0	1	0	1	0	0	0
314	Beech	1.55	/	0	1	1	2	0	0	1	0
315	Oak	1.9	/	1	1	1	1	1	0	1	1
316	Beech	2.55	/	0	1	1	1	1	0	0	0
317	Beech	0.95	/	0	0	0	3	1	0	1	0
318	Oak	1.5	/	0	0	0	2	1	0	0	1
319.01	Oak	1.95	/	2	0	1	1	1	0	1	1
319.02	Oak	1.15	/	2	0	0	1	1	0	0	0
320	Oak	1.75	/	2	1	2	2	3	0	3	3
321	Beech	0.8	/	0	0	0	1	1	0	1	1
322	Beech	1.25	/	0	0	1	1	1	0	1	1
323.01	Whitebeam	0.95	/	0	1	1	1	0	0	1	1
323.02	Whitebeam	0.8	/	0	0	0	1	0	0	1	0

Tree No.	Species	Girth	Jul-94	16/08/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
324.01	Silver birch	1.05	/	0	0	1	1	0	0	2	0
324.02	Silver birch	1	/	0	0	1	0	0	0	1	0
324.03	Silver birch	0.85	/	1	0	0	1	0	0	0	0
324.04	Silver birch	0.9	/	0	0	0	1	0	0	2	0
325	Beech	1.2	/	1	1	0	1	0	0	1	1
326	Silver birch	0.8	/	0	0	0	0	0	0	0	1
327	Silver birch	1.35	/	0	0	0	0	0	0	0	0
328.01	Oak	0.6	/	1	1	1	0	1	0	1	0
328.02	Oak	0.6	/	0	1	2	1	1	1	1	0
329	Beech	0.56	/	0	/	0	1	0	1	0	0
330	Oak	1.53	/	2	1	1	1	1	0	1	1
331	Oak	2.05	/	2	1	1	3	3	0	1	2
332	Oak	1.65	/	3	1	2	3	2	0	1	3
333	Oak	1.25	/	1	0	0	1	1	0	1	1
334	Oak	0.6	/	0	/	0	0	0	0	0	0
335	Beech	4.52	/	1	0	1	1	0	0	0	1
336	Silver birch	1	/	0	0	0	0	0	0	1	0
337	Silver birch	1.05	/	0	0	0	0	0	0	2	0
338	Group	0.35	/	0	0	0	0	0	0	0	0
339	Beech	2.52	/	2	0	0	2	0	0	0	0
340	Oak	2.56	/	2	1	2	2	2	0	0	1
341	Oak	2.03	/	1	0	1	1	1	0	1	1
342	Oak	2.07	/	3	1	1	2	3	0	0	2
343	Oak	1.7	/	1	1	0	2	2	0	0	1
344	Oak	2.66	/	4	2	2	1	3	1	0	1
345	Oak	1.76	/	2	0	1	1	2	1	0	1
346	Oak	1.83	/	2	1	1	2	2	1	0	3
347.01	Oak	0.9	/	1	1	1	1	1	0	0	1
347.02	Oak	0.94	/	1	1	0	1	1	0	0	0
347.03	Oak	0.63	/	1	1	0	0	0	0	0	1
348	Oak	2.56	/	3	1	2	3	4	0	1	2
349	Oak	2.02	/	3	1	1	2	2	1	3	2
351	Oak	1	/	1	0	0	1	0	0	0	1
352	Beech	3.37	/	2	1	1	2	2	0	1	0
353	Beech	0.58	/	1	0	1	1	1	2	1	1
354	Oak	1.12	/	1	1	1	1	1	0	1	1
355	Beech	2.52	/	0	1	1	1	0	1	1	0
356	Beech	1.13	/	0	1	1	1	0	0	1	1
357	Oak	2.03	/	3	1	3	3	2	2	2	3
358	Silver birch	0.75	/	1	1	1	1	1	1	1	0
360	Oak	0.9	/	1	1	0	1	0	0	1	1
361	Oak	1.21	/	2	2	3	2	2	0	1	3
362	Oak	0.85	/	1	1	2	1	1	2	0	1
363	Oak	0.84	/	1	1	1	0	0	0	1	1
364	Beech	1.76	/	1	1	0	2	0	0	1	1
365	Oak	2.34	/	3	1	2	1	2	0	1	2
366	Beech	1.05	/	1	0	1	0	0	0	1	1
367	Oak	1.43	/	3	1	2	1	2	0	1	2
368.01	Oak	0.83	/	2	0	0	1	1	0	0	1
368.02	Oak	0.7	/	/	0	0	2	0	0	0	0
369	Oak	1.51	/	3	1	2	1	1	1	1	3
370	Oak	0.75	/	2	1	1	1	1	0	0	1
371	Oak	2.24	/	2	1	2	3	3	0	1	1
372.01	Oak	1.16	/	2	1	1	1	1	0	1	1
372.02	Oak	1.1	/	2	1	1	1	0	0	1	1
373	Oak	1.08	/	2	1	2	3	2	0	0	1
374.01	Oak	1.05	/	2	1	1	0	1	0	0	1
374.02	Oak	0.94	/	2	1	1	0	1	0	1	0
374.03	Oak	0.54	/	0	1	1	0	1	0	0	0
375	Oak	1.08	/	1	1	1	1	1	0	0	1
376.01	Oak	0.9	/	2	1	1	1	1	0	0	2
376.02	Oak	0.93	/	1	1	1	1	1	0	0	0
376.03	Oak	0.59	/	0	1	0	1	0	0	1	0
377	Group	0.4	/	0	0	0	0	0	0	0	0
378	Silver birch	1.36	/	0	0	1	/	0	0	1	1
379	Silver birch	0.95	/	1	0	0	1	1	0	2	1
380	Silver birch	1.3	/	1	1	1	2	0	1	3	3
381	Duplicate of 358										

Tree No.	Species	Girth	Jul-94	16/08/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
382	Beech	3.24	/	3	2	0	3	1	1	1	2
383	Beech	0.84	/	0	1	1	1	1	0	1	1
384	Silver birch	0.8	/	0	1	0	1	0	0	1	0
385	Beech	0.88	/	1	1	1	1	1	0	1	0
386	Beech	0.59	/	0	0	1	1	1	0	1	0
387	Silver birch	0.92	/	0	0	0	1	0	0	1	0
388	Silver birch	0.84	/	0	0	0	0	0	0	0	0
389	Silver birch	0.91	/	0	0	0	0	0	0	1	0
390	Group	0.4	/	0	0	0	0	0	0	0	0
391	Silver birch	1.35	/	0	0	1	1	1	0	2	0
392	Silver birch	1.08	/	0	1	0	0	0	0	1	0
393	Silver birch	0.66	/	0	0	1	0	0	0	1	1
394	Silver birch	0.57	/	0	0	0	0	0	0	1	0
395	Silver birch	0.75	/	0	1	1	1	0	0	1	0
396	Oak	0.6	/	1	1	1	1	1	0	0	1
397	Oak	1.52	/	3	1	3	2	2	0	1	2
398	Beech	1.5	/	0	1	0	3	1	0	0	1
399	Oak	1.41			1	2	1	3	1	0	3

Halse grids 1 and 2

Tree No.	Species	Girth	Jul-94	16/08/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
1.01	Beech	1.18	0	1	1	0	2	1	0	0	1
1.02	Beech	1.07	1	1	1	0	2	1	0	0	1
1.03	Beech	0.72	0	1	0	0	2	0	0	0	1
2	Beech	0.04	0	0	0	0	1	0	0	0	0
3	?Goats willow	0.09	0	0	1	0	0	0	0	1	0
4	Silver birch	0.05	0	0	0	0	1	0	0	0	0
5.01	Goats willow?	0.31	1	1	1	1	1	0	0	2	0
5 02	Goats willow?	0.18	1	1	0	1	1	0	0	1	0
6	Oak	1.74	3	3	3	3	2	3	0	2	3
7	Goats willow?	0.2	0	0	2	1	1	0	0	2	0
8	Silver birch	0.06	0	0	0	0	0	0	0	0	0
9	Beech	0.89	1	1	1	1	1	0	0	0	0
10	Beech	1.56	1	1	1	0	2	1	0	0	1
11	Oak	1.69	3	2	2	3	2	3	0	1	1
12	Silver birch	0.2	1	0	0	0	0	0	0	2	0
13.01	Beech	1.72	1	1	2	1	3	1	0	2	0
13.02	Beech	0.75	1	0	1	0	2	0	0	2	0
14	Beech	0.05	0	0	0	0	0	0	0	0	0
15	Goats willow?	0.25	0	0	1	0	1	0	0	0	0
16	Silver birch	0.07	0	0	0	0	0	0	0	0	0
17	Silver birch	0.06	0	0	0	0	1	0	0	0	0
18.01	Goats willow?	0.35	0	0	0	2	1	0	0	2	0
18.02	Goats willow?	0.28	0	0	1	2	1	1	0	2	0
19	Silver birch	0.06	0	0	0	0	1	0	0	0	0
20	Silver birch	0.06	0	0	0	0	0	0	0	0	0
21	Beech	1.87	3	2	2	0	3	2	0	2	2
22	Silver birch	0.54	1	1	2	2	2	1	0	2	2
23	Silver birch	0.19	0	1	2	1	1	0	0	2	1
24	Silver birch	0.19	0	0	0	0	1	0	0	2	0
25	Silver birch	0.2	0	0	1	1	1	0	0	2	0
26	Silver birch	0.08	0	0	0	0	1	0	0	1	0
27	Goats willow	0.32	1	0	1	2	0	1	0	3	0
28	Goats willow	0.27	1	0	2	2	0	1	0	2	0
29	Beech	0.05	0	0	0	0	0	0	0	0	0
30.01	Oak	1.01	3	3	3	2	2	3	0	1	3
30.02	Oak	0.72	0	1	2	1	1	0	0	0	1
30.03	Oak	1.04	3	3	3	2	2	3	0	1	2
31.01	Oak	1.54	3	2	3	3	2	3	0	0	2
31.02	Oak	1.46	3	3	3	3	2	3	0	1	2
32	Silver birch	1.29	0	0	1	0	1	1	0	1	2
33	Beech	0.08	1	1	0	1	1	0	0	1	0
34	Beech	0.07	0	0	1	1	1	0	0	0	0
35	Oak	0.54	0	2	1	1	1	2	0	1	1
36	Goats willow?	0.59	0	1	1	0	1	0	0	1	1

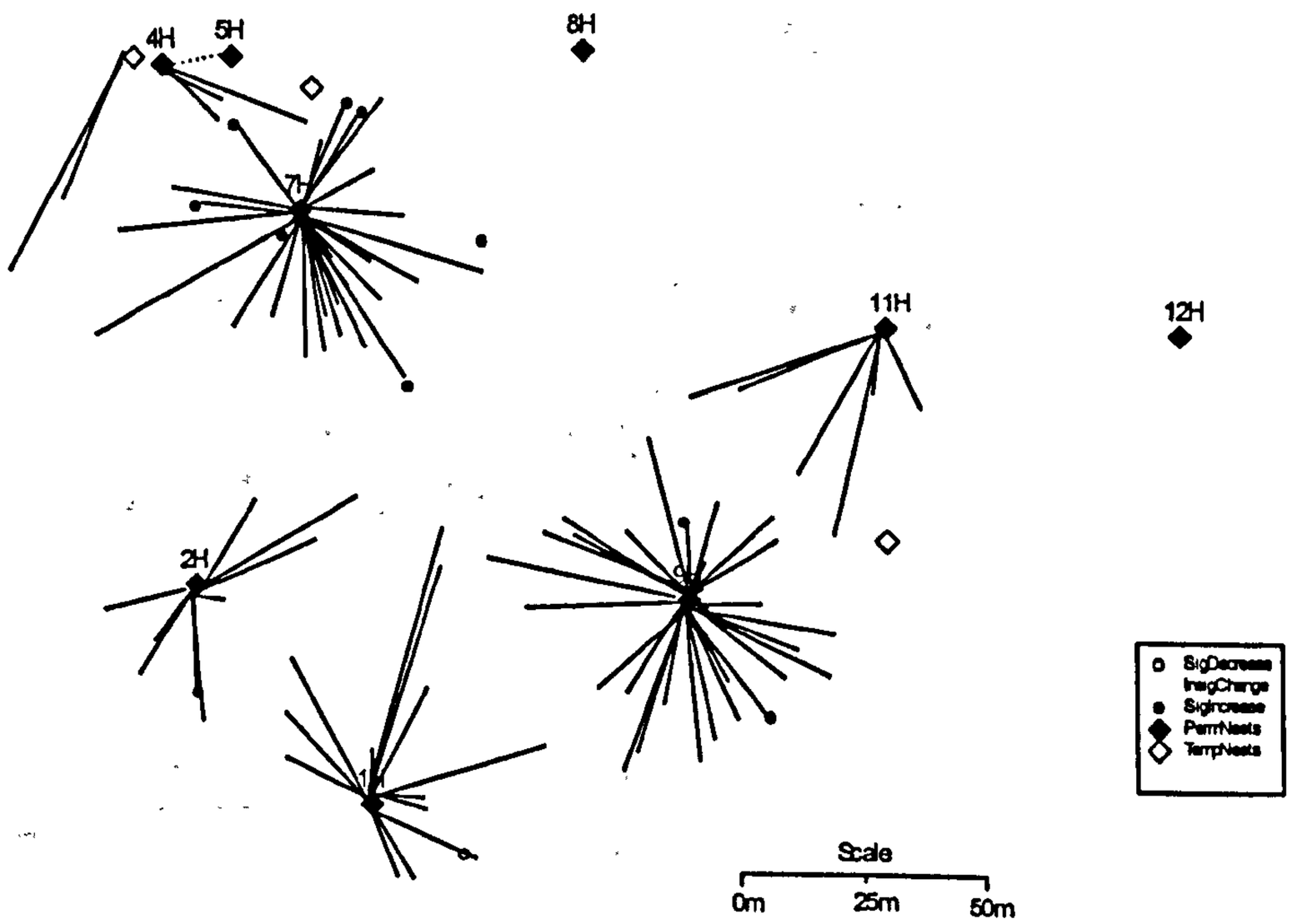
Tree No.	Species	Girth	Jul-94	16/08/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
37	Beech	0.11	1	0	1	1	1	1	0	1	0
38	Beech	1.37	1	0	0	0	2	1	0	1	0
39	Goats willow?	0.28	0	0	0	0	1	0	0	1	0
40	Silver birch	0.39	0	0	0	0	0	0	0	1	0
41	Beech	3.36	1	1	0	0	1	0	0	1	1
42	Beech	1.55	1	0	0	0	2	1	0	1	1
43	Oak	1.17	3	2	3	1	1	0	0	0	1
44	Beech	1.22	1	1	1	1	1	0	0	1	1
45	Beech	1.6	3	2	2	1	3	2	0	1	1
46	Oak	1.13	3	2	3	2	3	3	0	1	2
47	Beech	2.42	1	0	1	1	2	1	0	0	1
48	Beech	1.3	0	0	1	1	1	1	0	1	0
49	Beech	1.3	1	1	1	0	2	1	0	1	1
50	Beech	1.1	1	0	1	0	1	1	0	1	1
52	Beech	2.47	3	2	2	2	3	3	0	1	1
53	Oak	1.51	5	4	3	3	3	3	1	2	3
54.01	Beech	2.1	1	1	1	0	3	0	0	1	1
54.02	Beech	0.52	0	0	0	0	2	0	0	0	0
55	Oak	1.99	3	3	3	3	2	2	0	1	3
56	Silver birch	0.87	0	0	0	0	1	0	0	1	0
57	Beech	2.3	2	1	1	0	1	1	0	1	1
58	Beech	1.52	0	0	1	1	2	1	0	1	1
59	Beech	1.58	0	0	2	0	2	0	0	1	0
60	Whitebeam	1.15	0	0	0	1	0	0	0	1	0
160	Oak	0.16	0	1	0	1	0	0	0	0	0
161	Beech	0.1	1	0	1	2	0	1	0	1	0
162	Beech	0.07	0	0	1	0	0	0	0	0	0
164	Oak		/	1	2	2	1	2	0	1	2
61	Oak	2.07	3	2	2	0	1	3	0	0	1
62	Oak	1.56	3	2	1	1	2	3	0	0	0
63	Oak	1.07	2	1	1	1	0	0	0	0	0
64	Oak	2.1	2	1	1	2	1	0	0	0	2
65	Beech	0.78	1	1	1	1	1	0	0	0	0
66	Beech	0.39	1	0	0	0	1	0	0	0	0
67	Oak	1.9	3	3	3	1	3	0	0	0	2
68	Oak	1.4	3	3	1	1	1	1	0	0	1
69	Oak	1.89	3	3	1	1	1	3	0	0	2
70	Oak	1.02	1	1	3	1	1	0	0	0	1
71	Oak	1.29	3	2	1	0	1	0	0	0	2
72	Oak	1.67	3	2	1	1	1	1	0	0	1
73	Oak	1.43	2	0	1	1	1	0	0	0	2
74	Beech	1.79	1	1	1	2	3	3	0	0	1
75	Beech	0.84	1	0	0	0	1	0	0	0	0
76	Silver birch	0.1	0	1	0	1	1	0	0	1	0
77	Silver birch	0.19	0	0	2	1	1	0	0	1	0
78	Silver birch	0.06	0	0	0	0	1	0	0	0	0
79.01	Silver birch	0.8	1	0	2	1	0	0	0	0	0
79.02	Silver birch	0.24	0	0	1	0	1	0	0	0	0
80	Oak	1.46	2	1	1	1	1	0	0	0	3
81	Oak	1.28	3	2	2	1	1	0	0	0	2
82	Oak	1.15	3	3	3	1	0	0	0	0	1
83	Oak	0.95	1	0	1	1	1	0	0	0	0
84	Oak	0.91	1	1	1	0	1	0	0	0	0
85	Oak	0.98	1	1	1	0	1	0	0	0	0
86	Oak	1.15	1	1	1	0	2	0	0	0	0
87	Oak	0.92	0	0	0	1	2	0	0	0	1
88	Oak	2.21	3	2	3	1	1	1	0	0	1
89	Silver birch	0.45	0	0	0	1	1	1	0	0	0
90	Oak	1.57	3	2	3	1	3	1	0	0	0
91	Beech	1.79	0	1	1	0	3	0	0	0	1
92	Oak	1.74	3	2	3	1	1	0	0	0	1
93	Whitebeam	0.09	0	0	0	0	0	0	0	0	1
94	Whitebeam	0.55	0	0	2	0	1	0	0	0	0
95	Beech	0.04	0	0	0	0	0	0	0	0	0
96	Silver birch	0.13	0	1	0	0	1	0	0	1	1
97	Silver birch	0.14	0	0	0	0	1	0	0	0	0
98	Silver birch	0.19	1	0	0	0	1	1	1	1	2
99	Silver birch	0.17	0	0	0	0	1	1	0	0	0

Tree No.	Species	Girth	Jul-94	16/08/94	12/04/95	24/05/95	19/07/95	06/09/95	15/11/95	17/04/96	24/06/96
100	Silver birch	0.4	1	0	0	1	2	0	0	0	0
101	Oak	4.79	4	4	4	3	1	1	1	0	3
102	Holly	0.41	0	0	0	2	1	2	0	0	/
103	Beech	1.97	3	1	1	1	2	1	0	0	1
104	Oak	0.86	1	1	2	1	1	0	0	0	1
105	Oak	1.31	3	2	3	1	3	1	0		0
106	Beech	1.99	3	2	2	1	1	0	0	0	0
107	Oak	0.98	1	1	2	1	1	0	0	0	0
108	Oak	1.23	3	3	3	1	1	0	0	0	0
109	Oak	1.01	3	3	3	1	1	0	0	0	0
110	Silver birch	0.15	0	0	0	0	1	0	0	0	0
111	Silver birch	0.12	1	0	1	0	0	0	0	0	0
112	Silver birch	0.13	0	0	1	2	1	0	0	0	0
114	Silver birch	0.1	0	0	0	0	1	0	0	0	0
115	Silver birch	0.27	1	0	0	0	1	0	0	0	0
116	Silver birch	0.1	0	0	0	0	0	1	0	0	0
117	Silver birch	0.16	0	0	0	0	1	0	0	0	0
118	Silver birch	0.09	0	0	0	0	1	0	0	1	0
119	Silver birch	0.31	0	0	1	0	0	0	0	0	0
120	Silver birch	0.12	0	0	0	0	0	0	0	0	0
121	Silver birch	0.21	0	0	1	0	1	0	0	0	0
122	Silver birch	0.12	1	0	0	0	1	0	0	0	0
123	Silver birch	0.2	0	0	1	0	1	0	0	0	0
124	Silver birch	0 08	0	0	0	0	1	1	0	1	0
125	Silver birch	0.13	0	0	2	0	0	0	0	0	0
126	Silver birch	0.19	0	0	2	1	1	0	0	0	0
127	Silver birch	0.17	0	0	1	0	0	0	0	0	0
128	Beech	0.1	0	0	1	0	0	0	0	0	0
129	Oak	0.76	1	1	1	0	0	0	0	0	0
130	Beech	1.18	1	1	1	1	1	0	0	0	0
131	Oak	0.73	1	0	2	1	1	1	0	0	0
132	Oak	1.22	3	3	2	1	1	1	1	0	0
133	Oak	0.81	2	3	3	1	1	1	0	0	0
134	Oak	0.29	0	1	0	0	0	0	0	0	0
135	Silver birch	0.72	1	1	0	1	0	0	0	0	0
136	Beech	1.78	1	1	1	1	1	0	0	0	0
137	Oak	0.63	1	2	1	1	1	0	0	0	0
138	Beech	0.03	0	0	0	0	1	0	0	0	0
139	Silver birch	0.13	0	0	0	0	1	0	0	0	0
140	Whitebeam	0.02	0	0	0	0	0	0	0	0	0
141	Whitebeam	0.06	0	0	0	0	0	0	0		0
142	Beech	0.11	0	0	0	0	1	0	0	0	0
143	Beech	0.03	0	0	0	0	1	0	0		0
144	Beech	0.1	1	0	0	1	1	1	0	0	0
145	Beech	0.05	0	0	0	0	1	0	0	0	0
146	Whitebeam	0.04	0	0	0	1	0	0	0	0	0
147	Beech	1.63	0	0	1	1	1	0	0	0	0
148.01	Whitebeam	1.16	0	0	1	0	2	0	0	0	0
148.02	Whitebeam	0.79	0	0	1	0	2	3	1	0	0
149	Oak	1.06	3	2	1	1	1	0	0	0	0
150	Oak	1.15	1	1	1	1	2	1	0	0	0
151	Oak	1.1	3	2	2	1	1	0	0	0	1
152	Oak	1.97	3	2	1	1	1	1	0	0	1
153	Oak	1.56	1	1	2	1	1	0	0	0	1
154	Oak	1.63	2	1	1	1	1	0	0	0	0
156	Silver birch	0.35	1	0	0	1	1	0	0	0	0
157	Silver birch	0.11	0	0	0	0	1	0	0	0	0
158	Silver birch	0.31	2	0	0	1	0	0	0	0	0
159	Silver birch	0.09	0	0	0	1	1	0	0	1	0
163	Oak		/	3	3	1	2	0	0	0	0
165	Oak	0.53	/	/	1	1	1	0	0	0	0
166	Oak	1.43	/	/	2	1	1	0	1	0	1
167	Oak	1.15	/	/	3	0	2	0	0	0	1

Appendix G: Difference maps for Halse (whole site) for 1994 to 1996

Figure G.1: Difference in foraging activity between adjacent counts for Halse whole site counts a) 07/94 with 16/08/94 b) 16/08/94 with 07/94

a)



b)

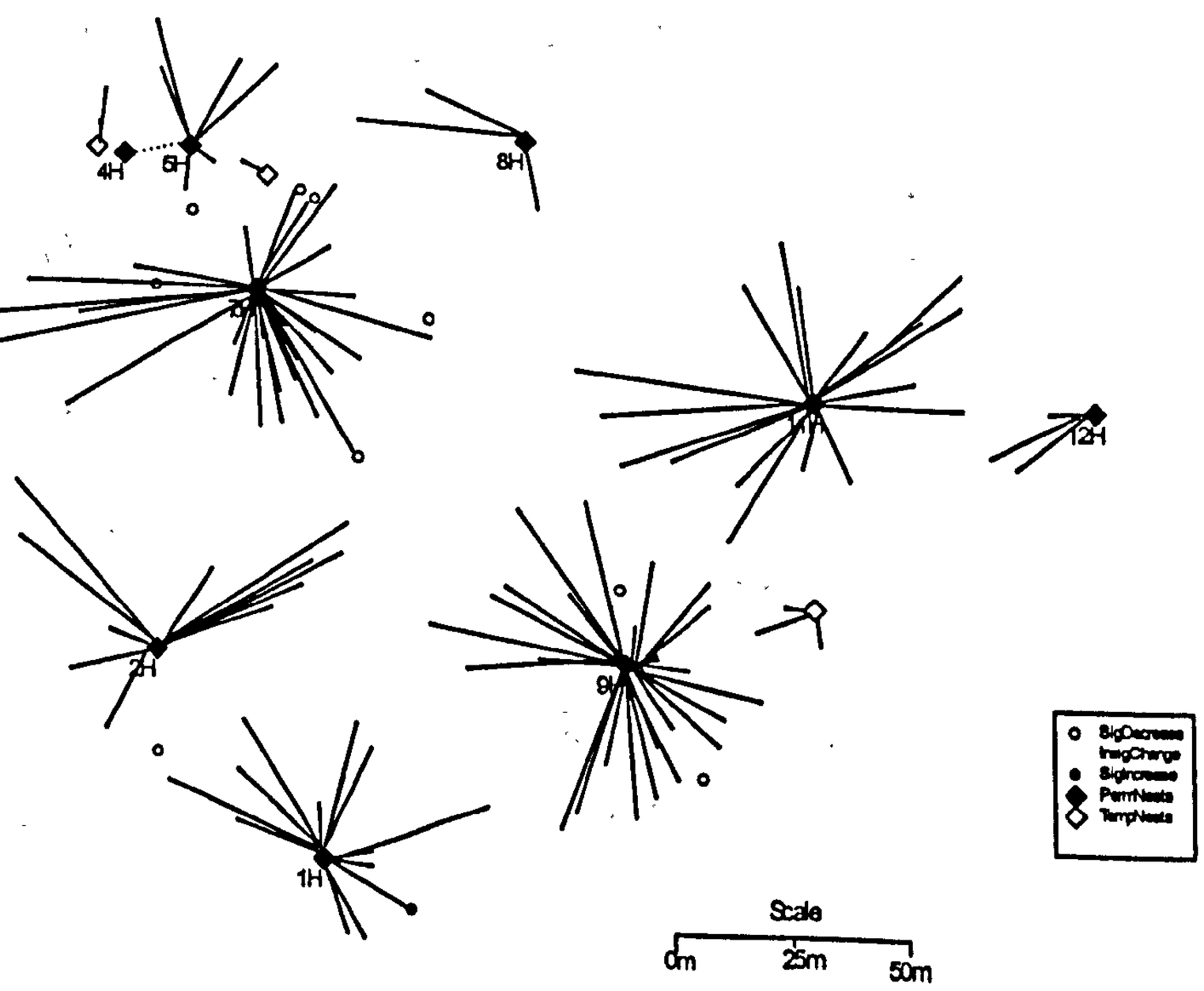
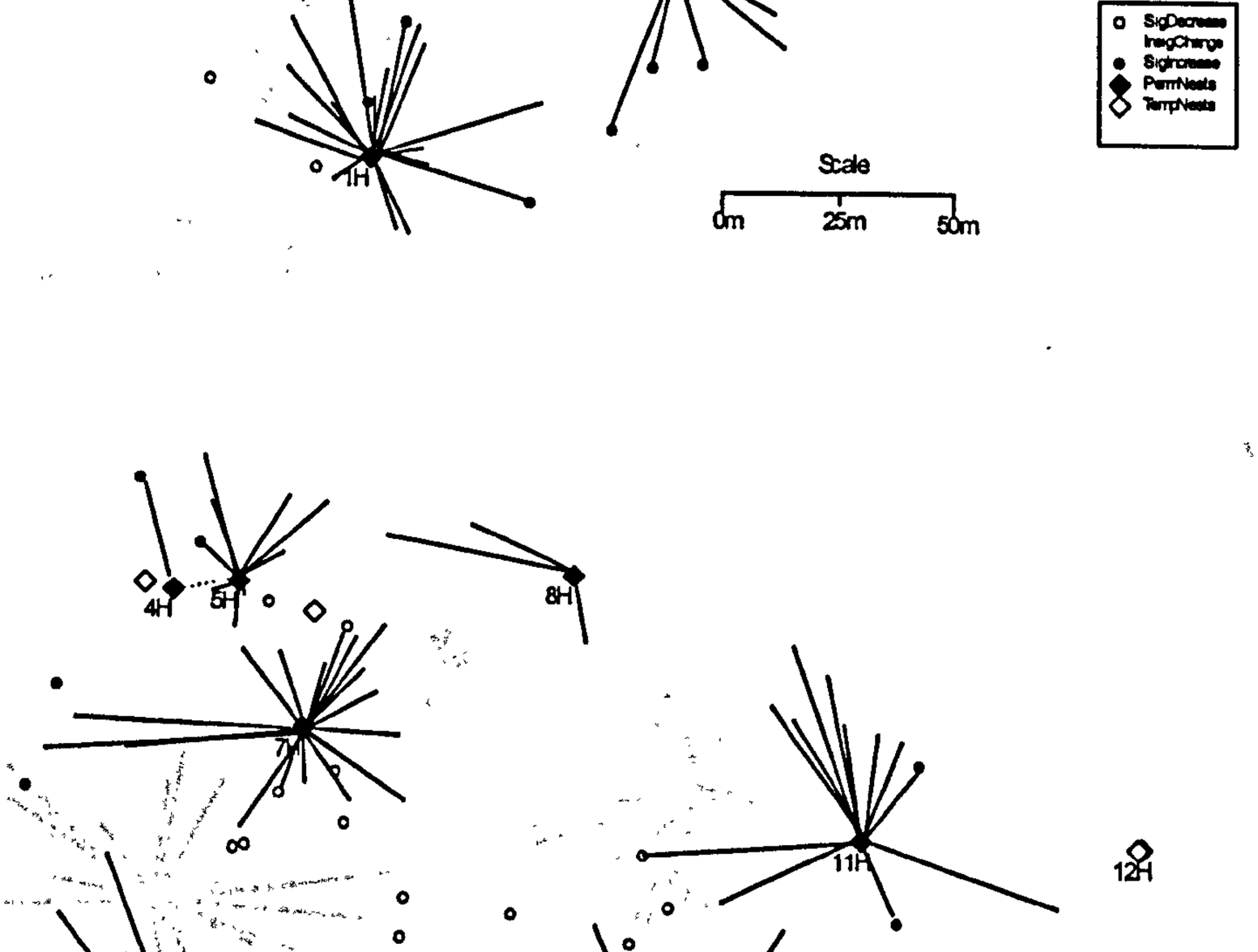


Figure G.2: Difference in foraging activity between adjacent counts for Halse whole site counts a) 12/04/95 with 24/05/95 b) 24/05/95 with 12/04/95

a)



b)

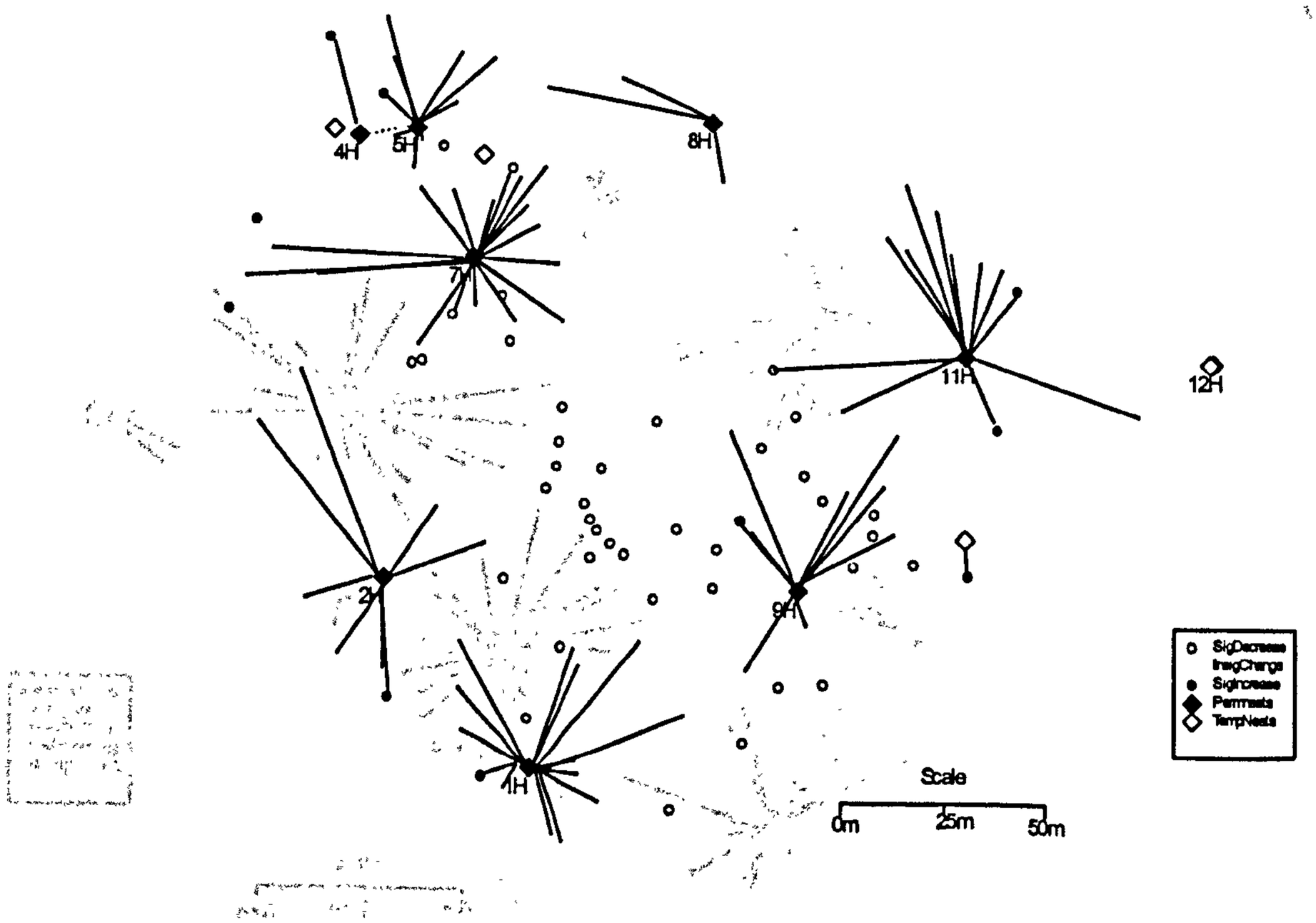
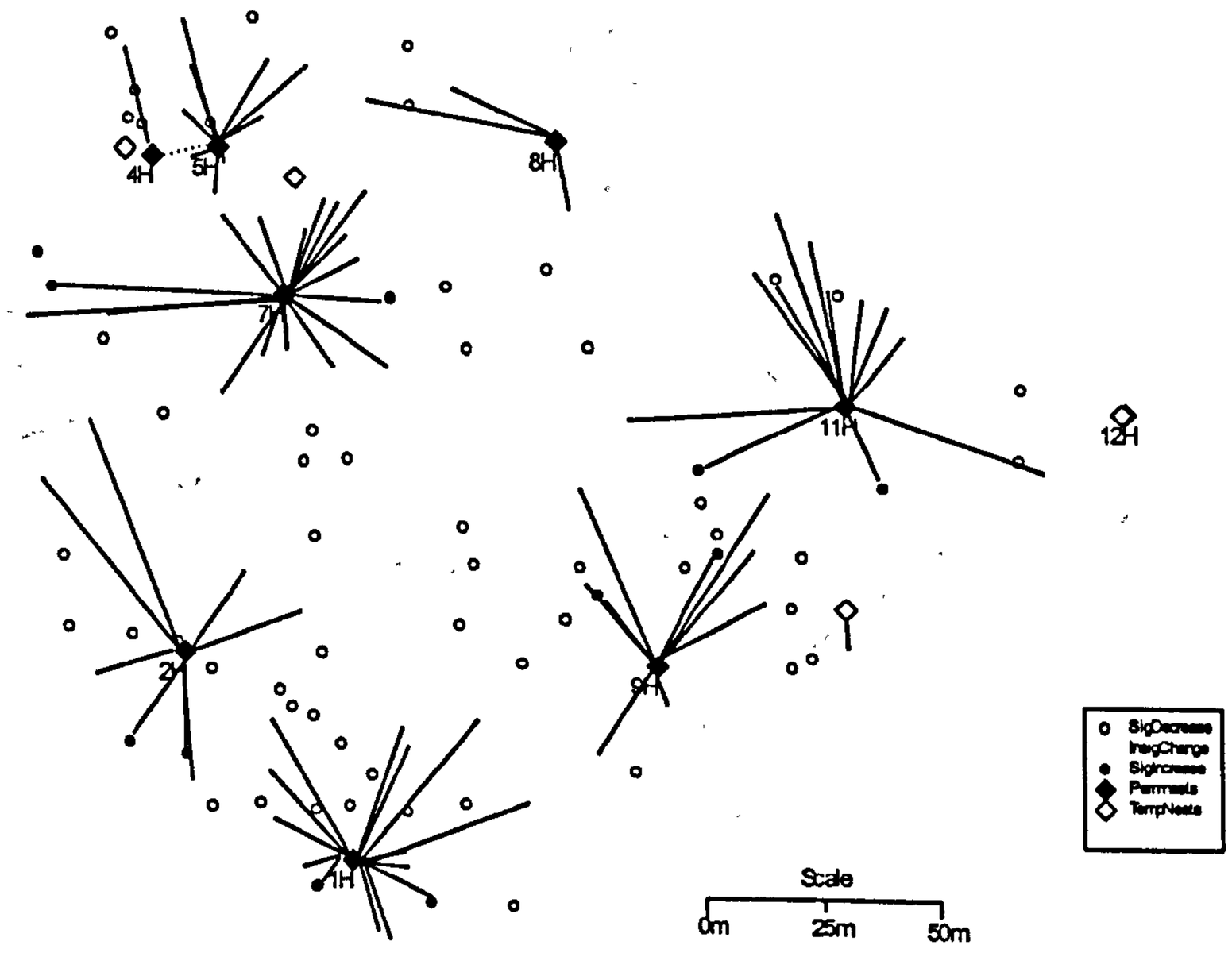


Figure G.3: Difference in foraging activity between adjacent counts for Halse whole site counts a) 24/05/95 with 19/07/95 b) 19/07/95 with 24/05/95

a)



b)

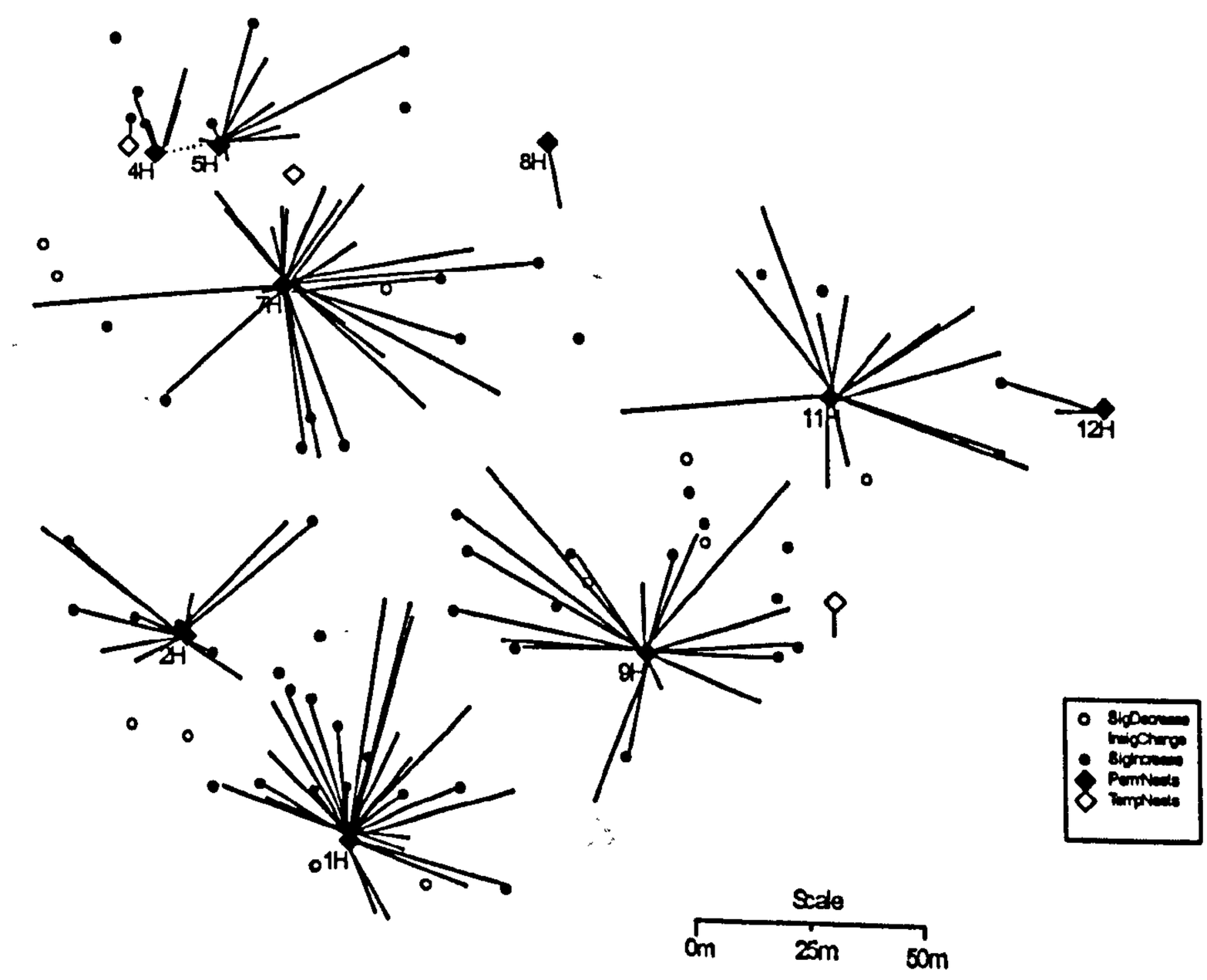
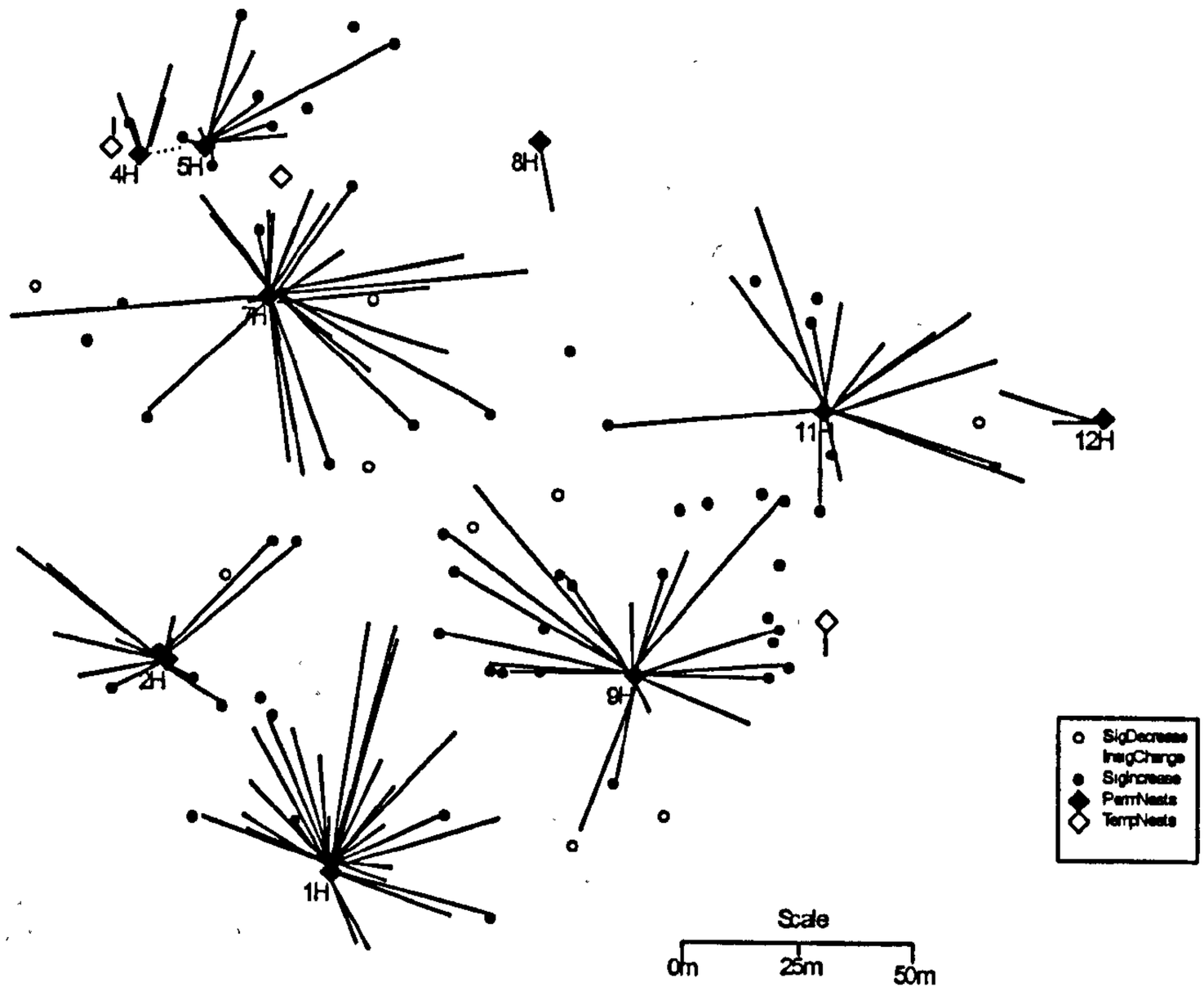


Figure G.4: Difference in foraging activity between adjacent counts for Halse whole site counts a) 19/07/95 with 06/09/95 b) 06/09/95 with 19/07/95

a)



b)

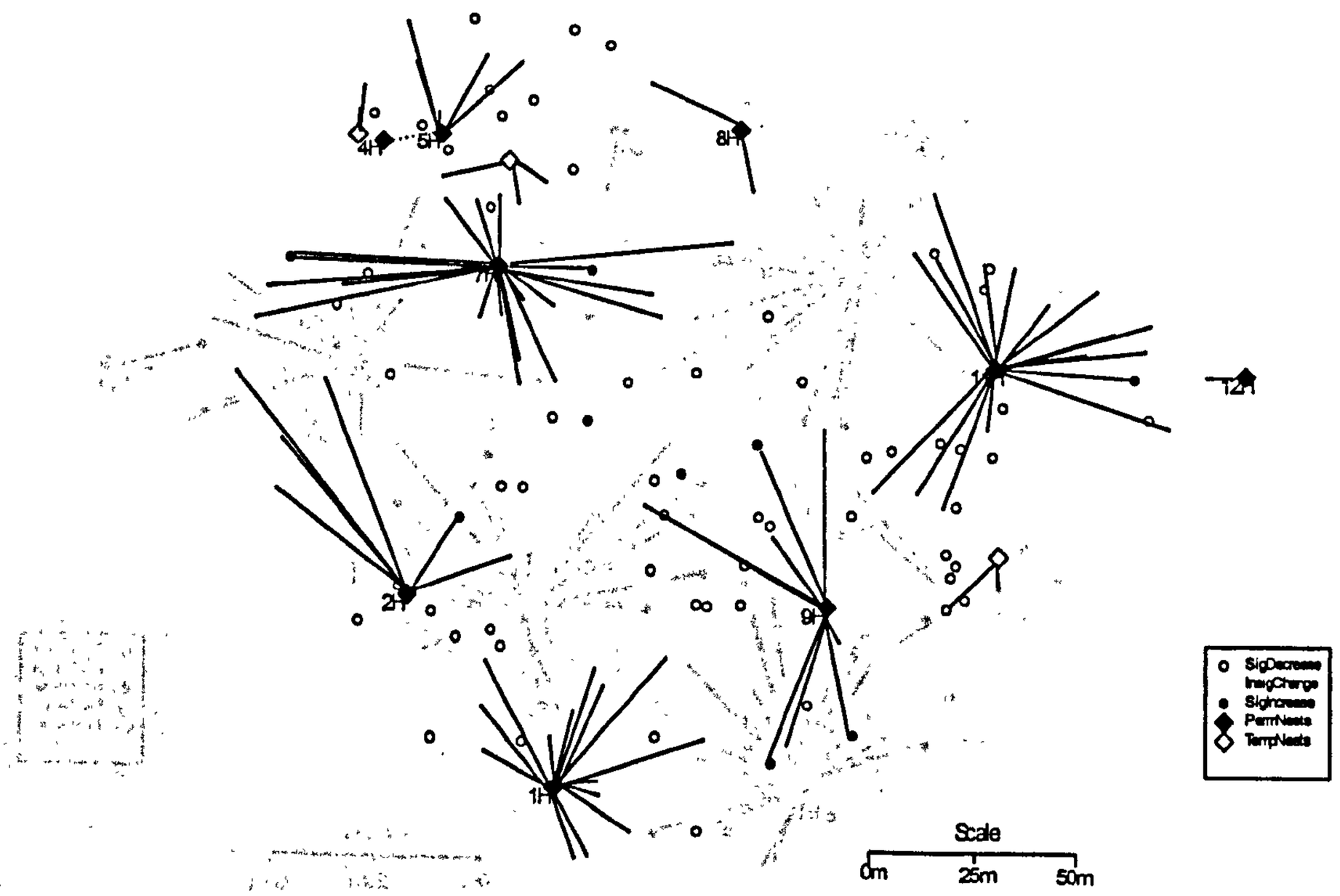
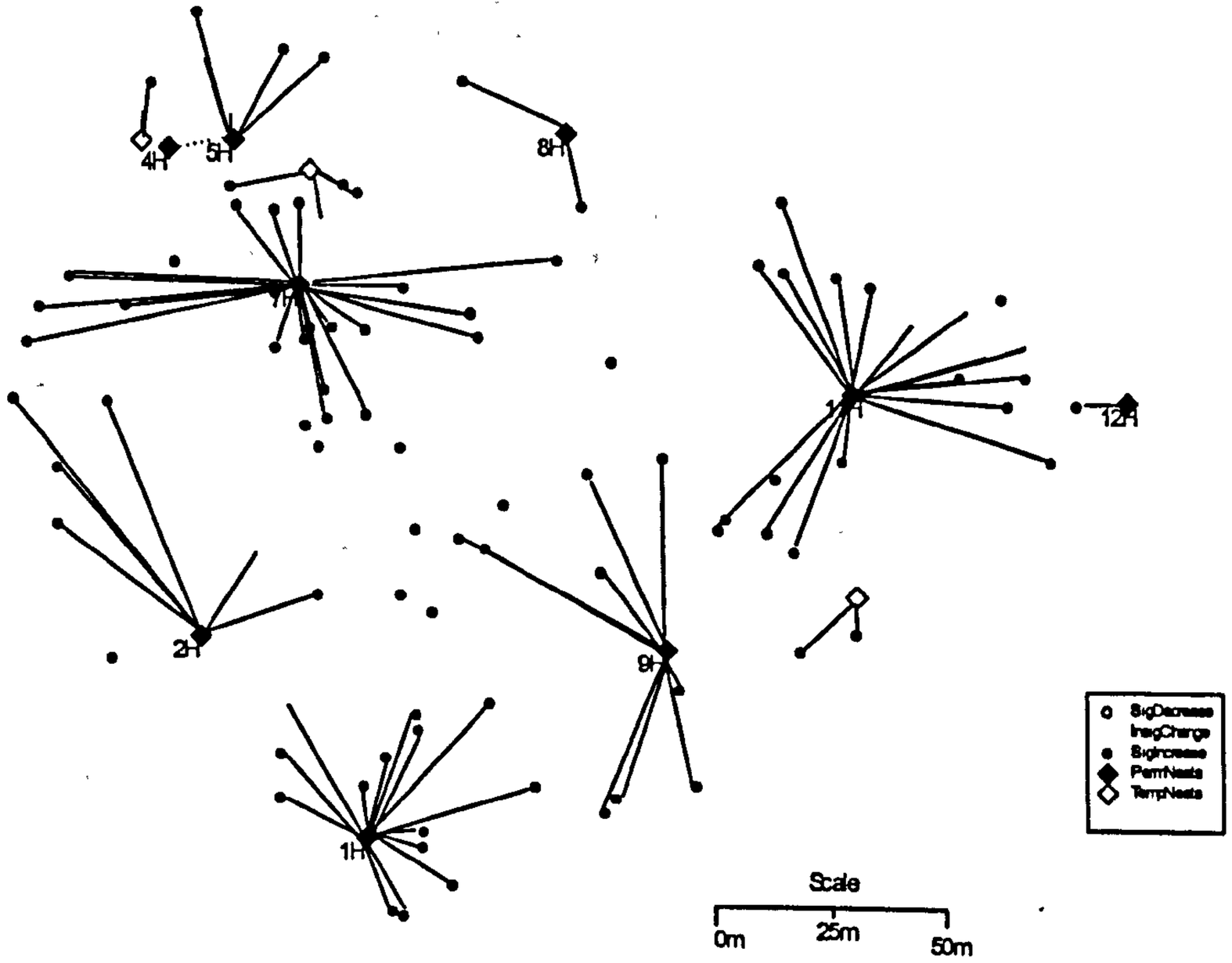


Figure G.5: Difference in foraging activity between adjacent counts for Halse whole site counts a) 06/09/95 with 15/11/95 b) 15/11/95 with 06/09/95

a)



b)

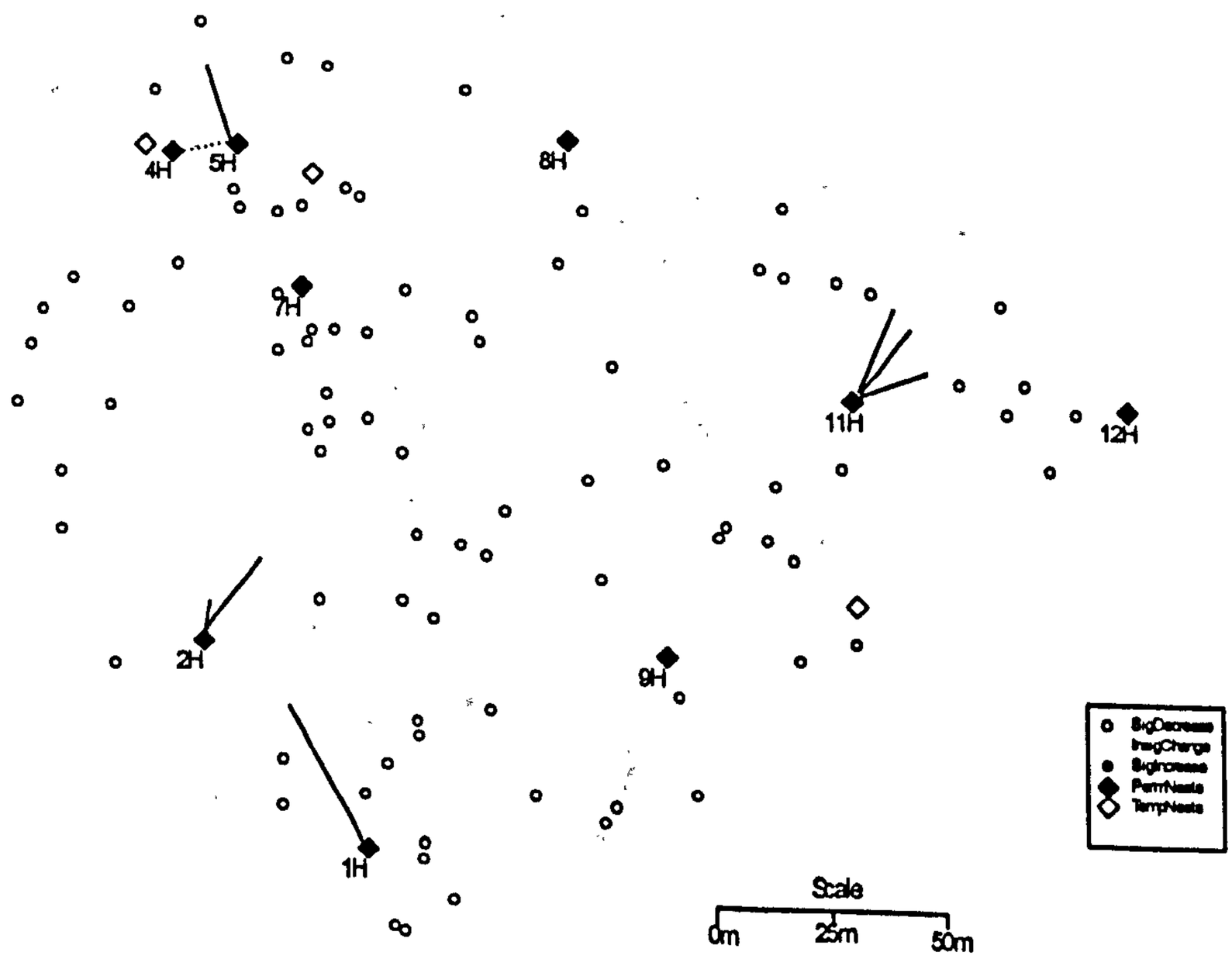
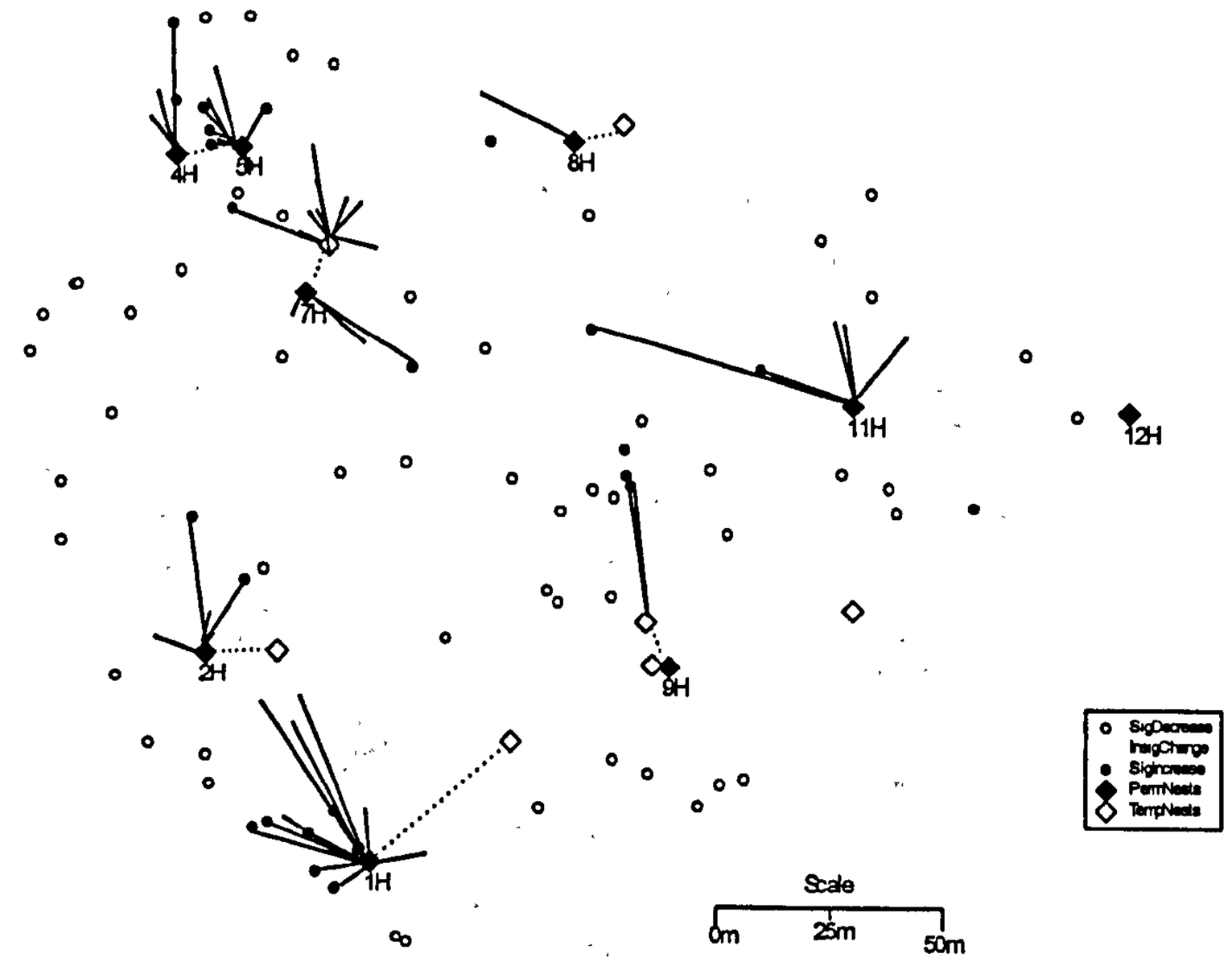


Figure G.6: Difference in foraging activity between adjacent counts for Halse whole site counts a) 17/04/96 with 24/06/96 b) 24/06/96 with 17/04/96

a)



b)

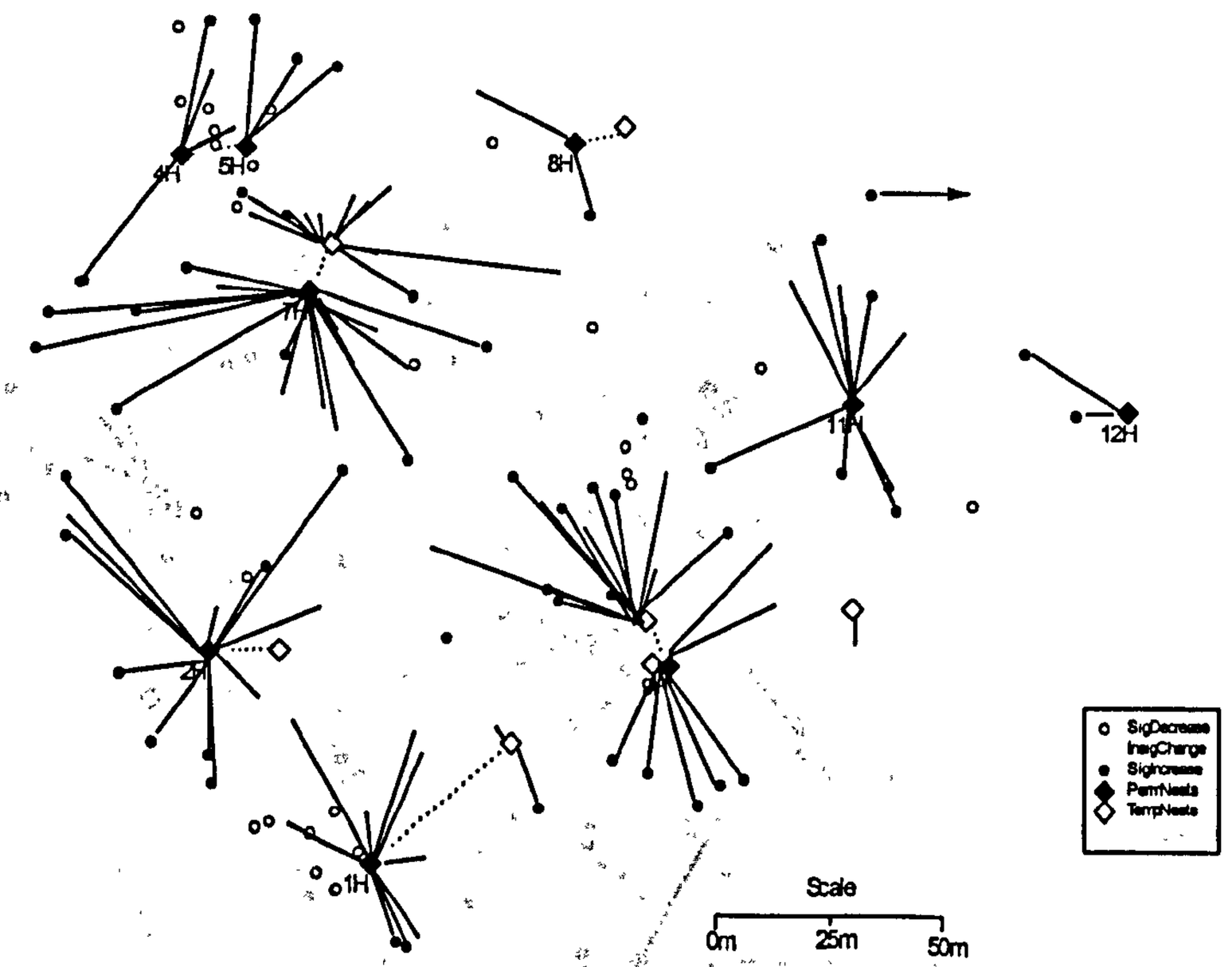
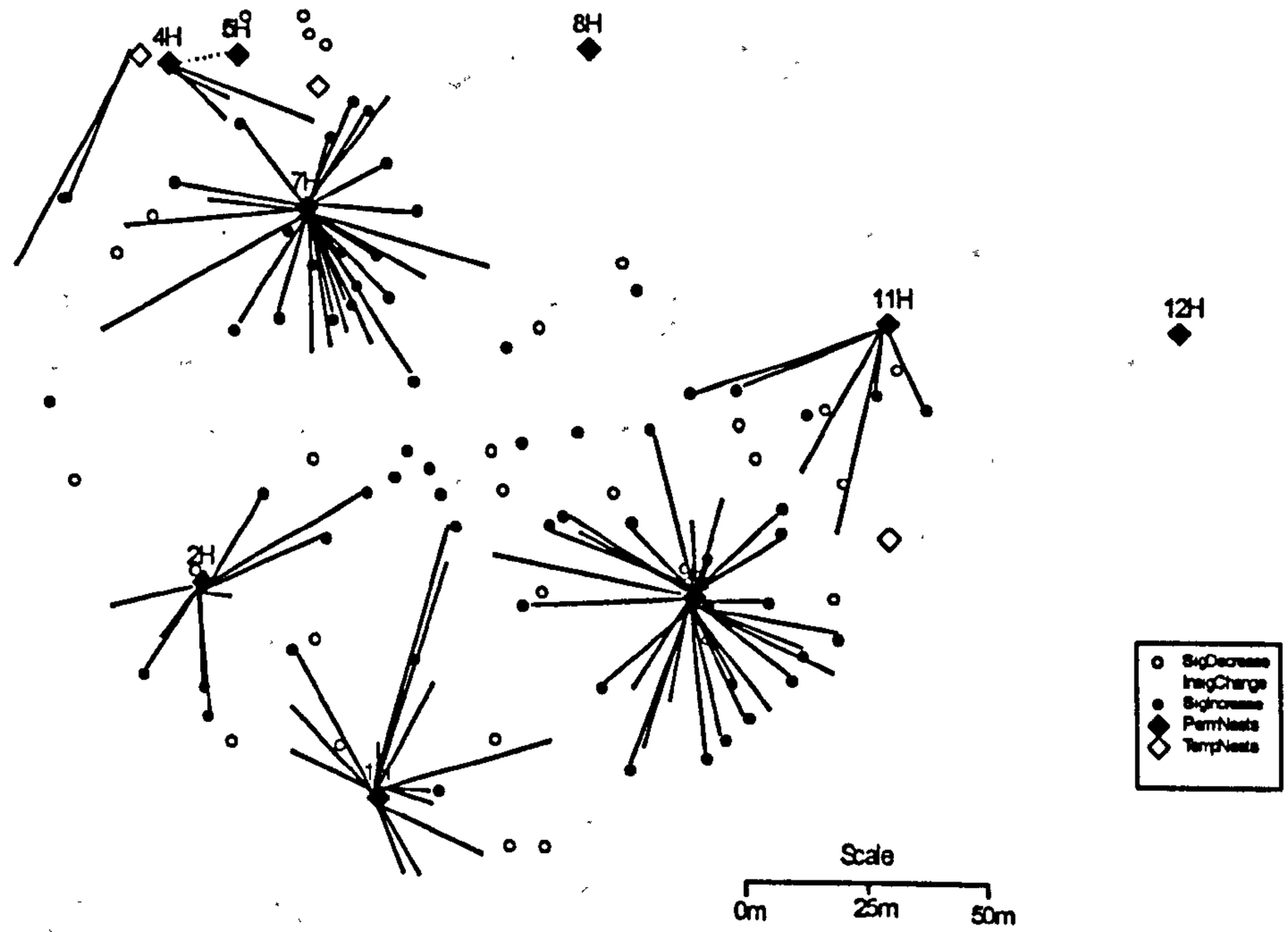


Figure G.7: Difference in foraging activity between different years for Halse whole site counts a) 07/94 with 19/07/95 b) 19/07/95 with 07/94

a)



b)

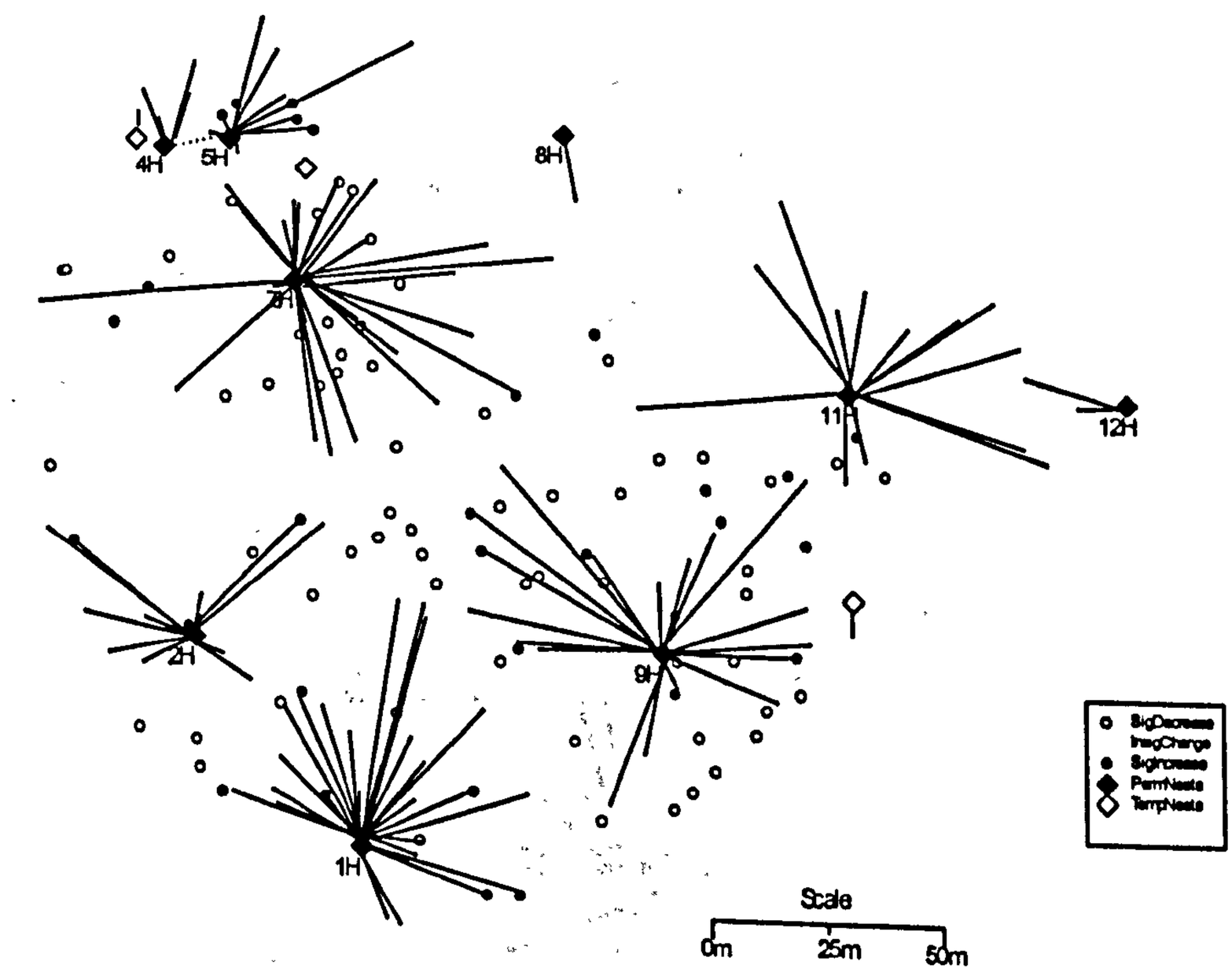
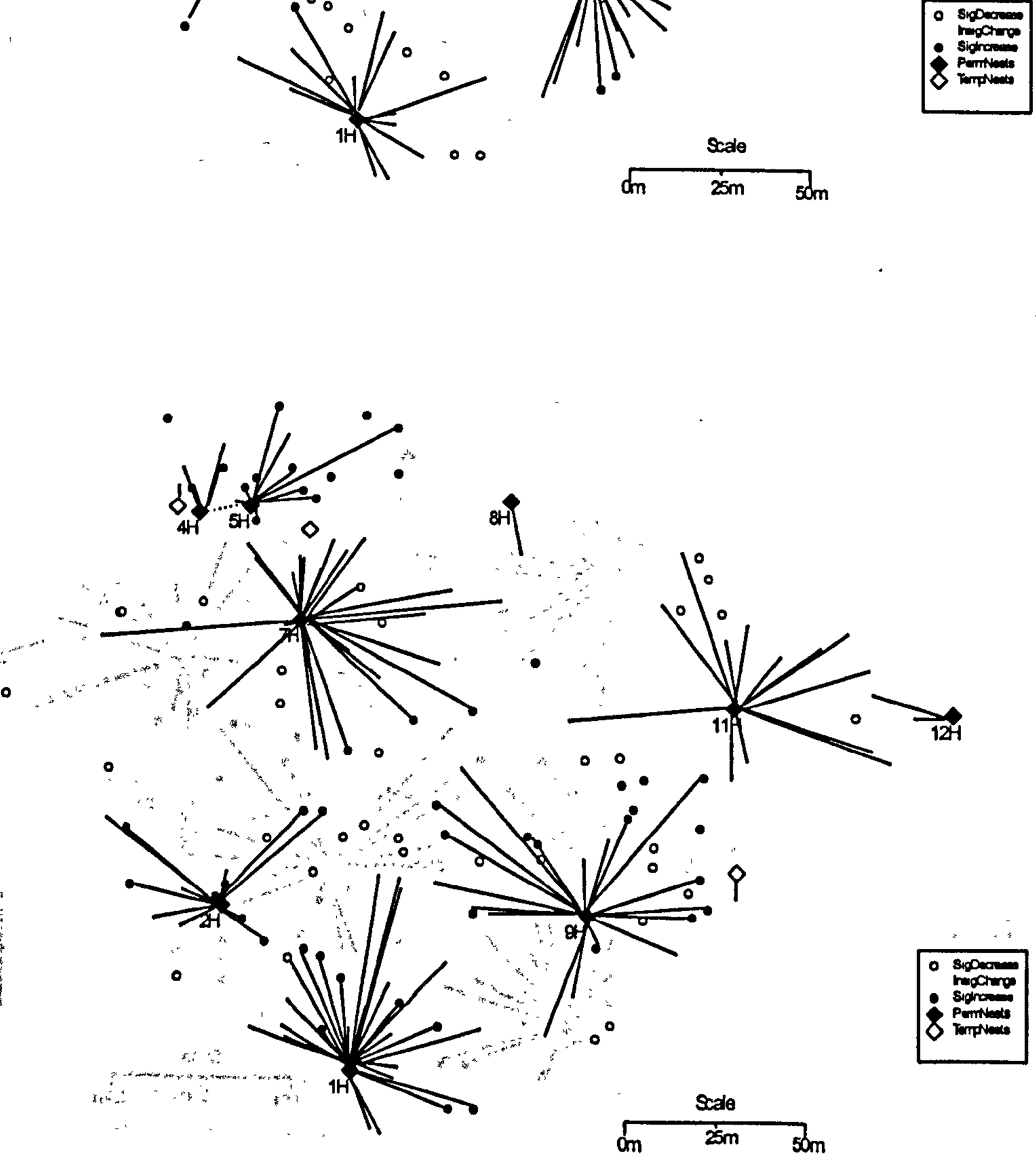


Figure G.8: Difference in foraging activity between different years for Halse whole site counts a) 16/08/94 with 19/07/95 b) 19/07/95 with 16/08/94

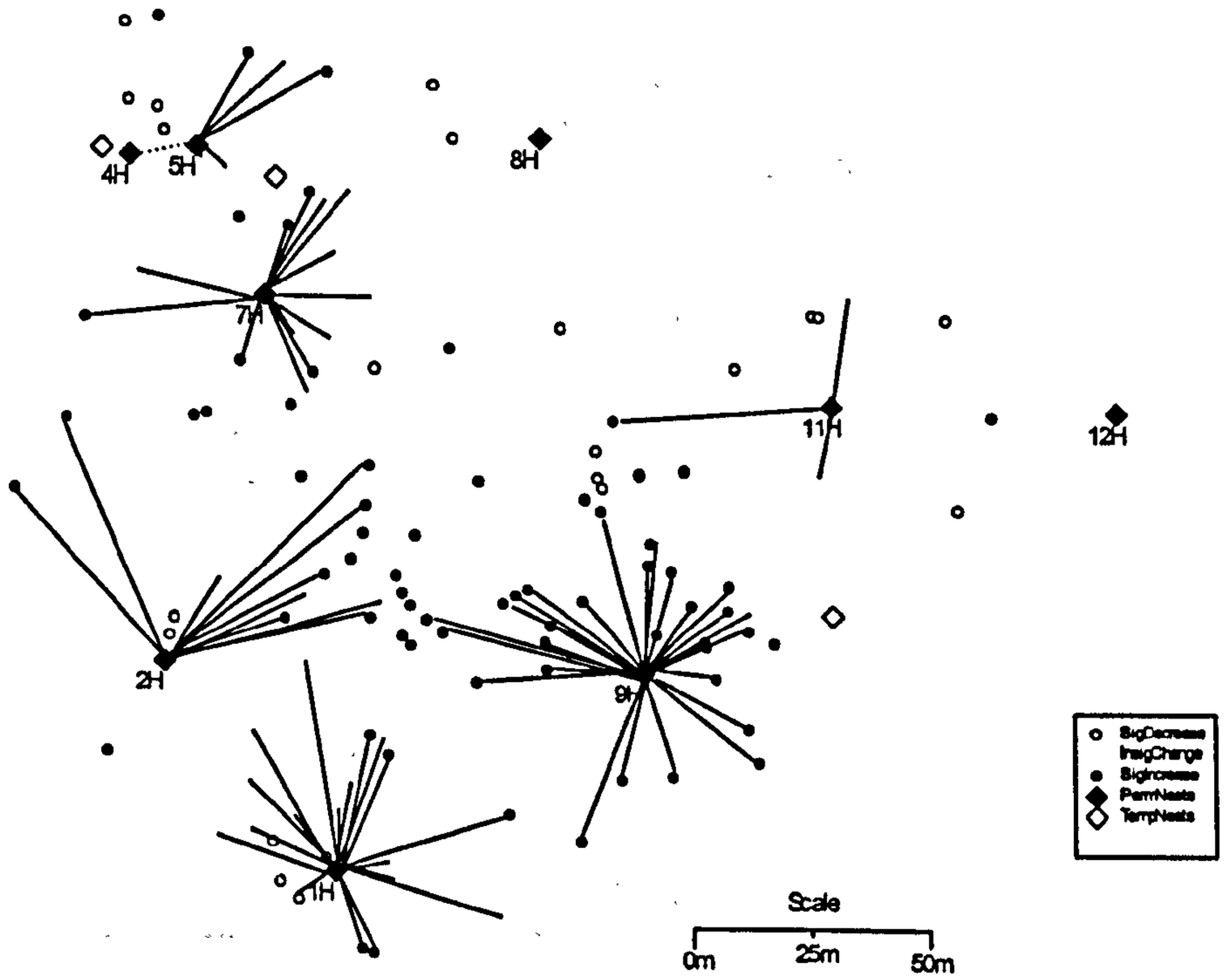
a)



b)

Figure G.9: Difference in foraging activity between different years for Halse whole site counts a) 12/04/95 with 17/04/96 b) 17/04/96 with 12/04/95

a)



b)

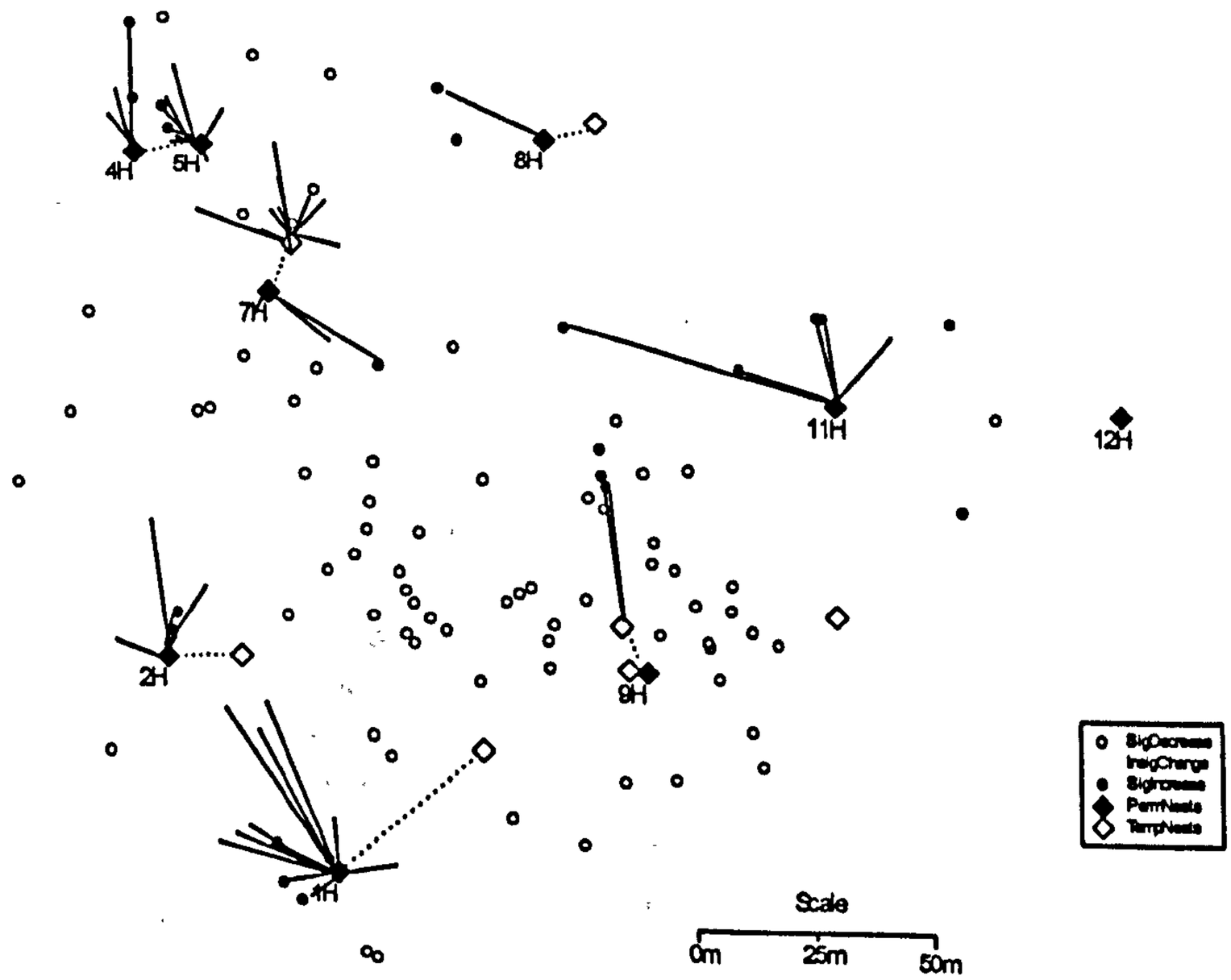
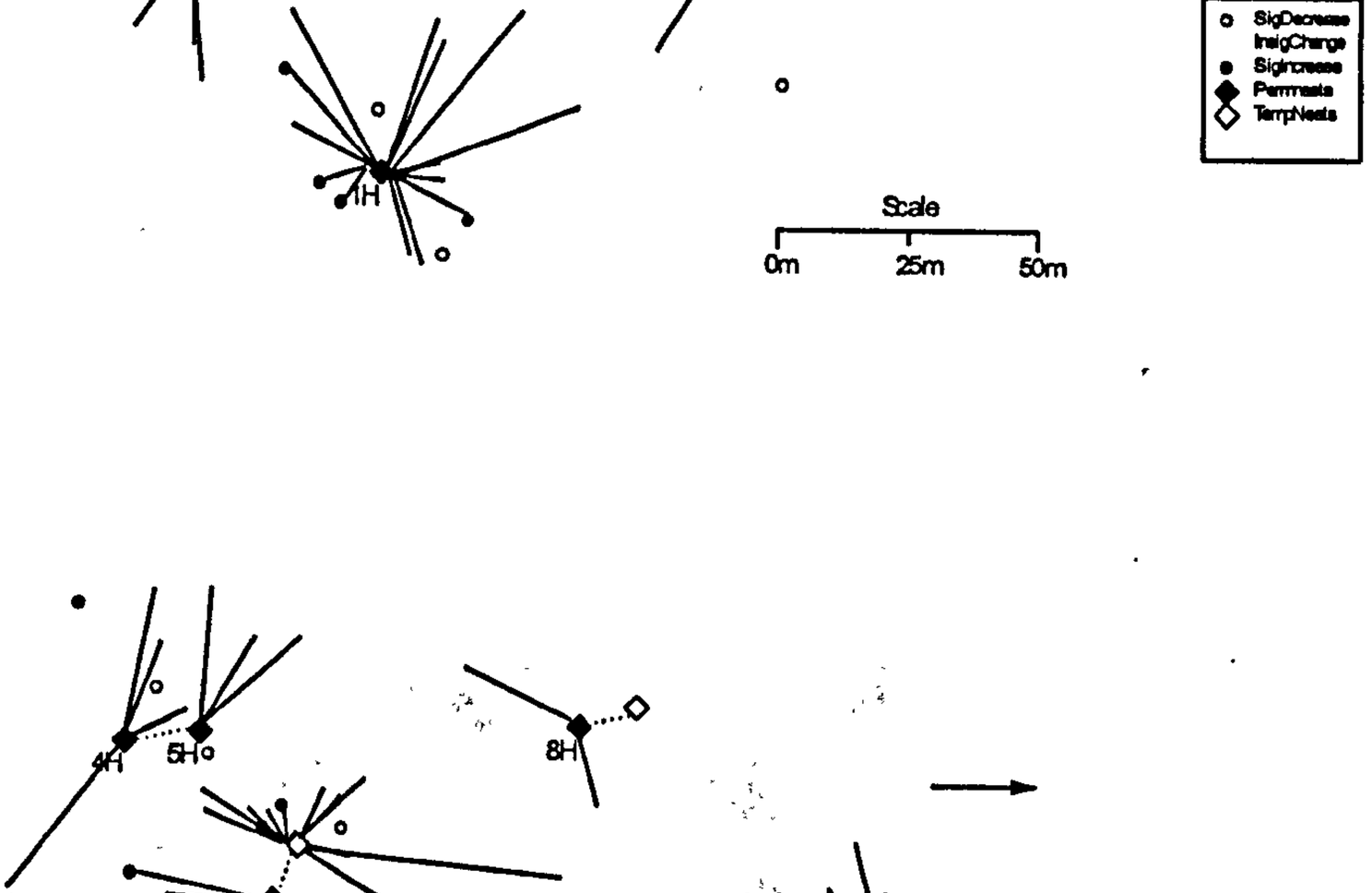


Figure G.10: Difference in foraging activity between different years for Halse whole site counts a) 24/05/95 with 24/06/96 b) 24/06/96 with 24/05/95

a)



b)

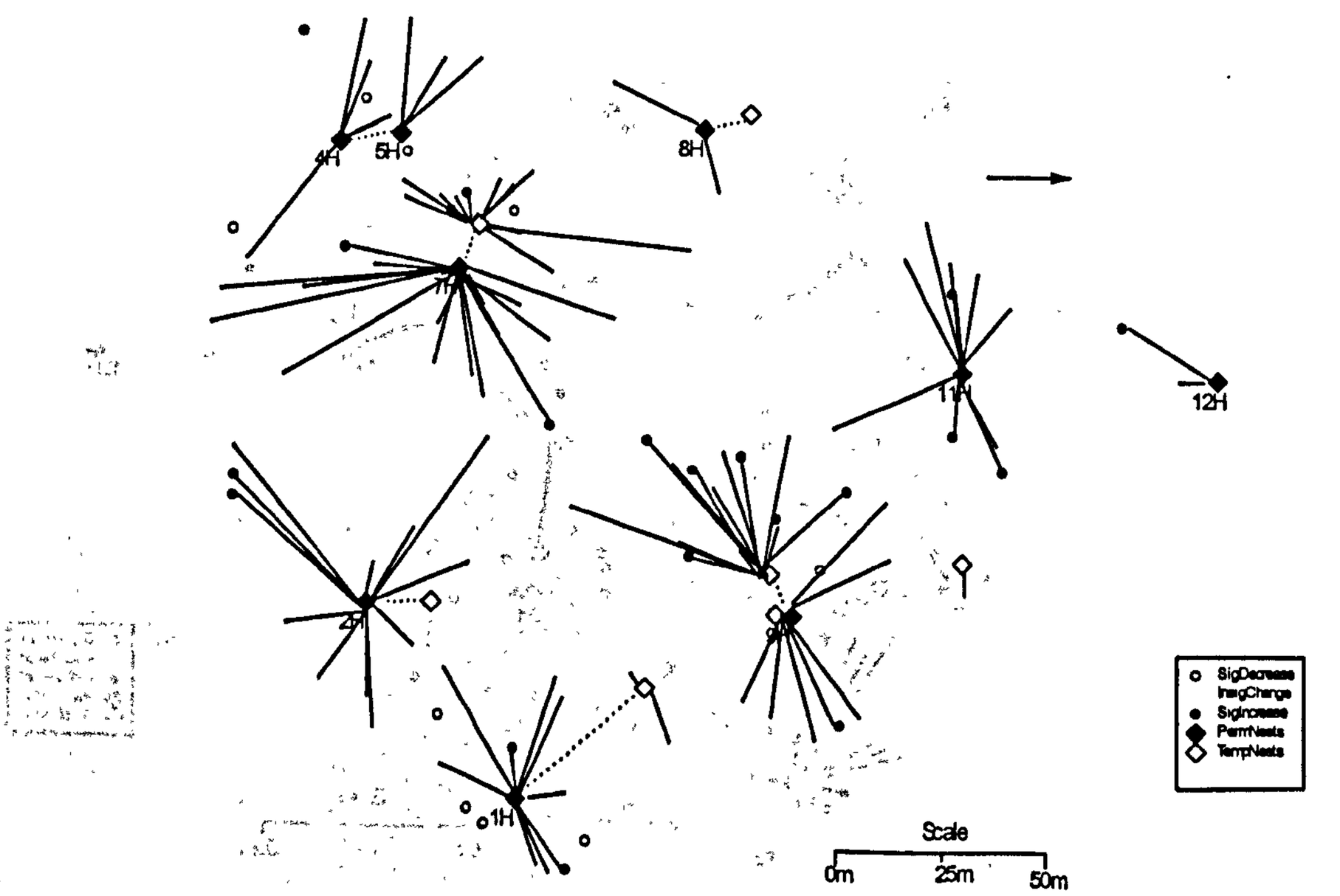
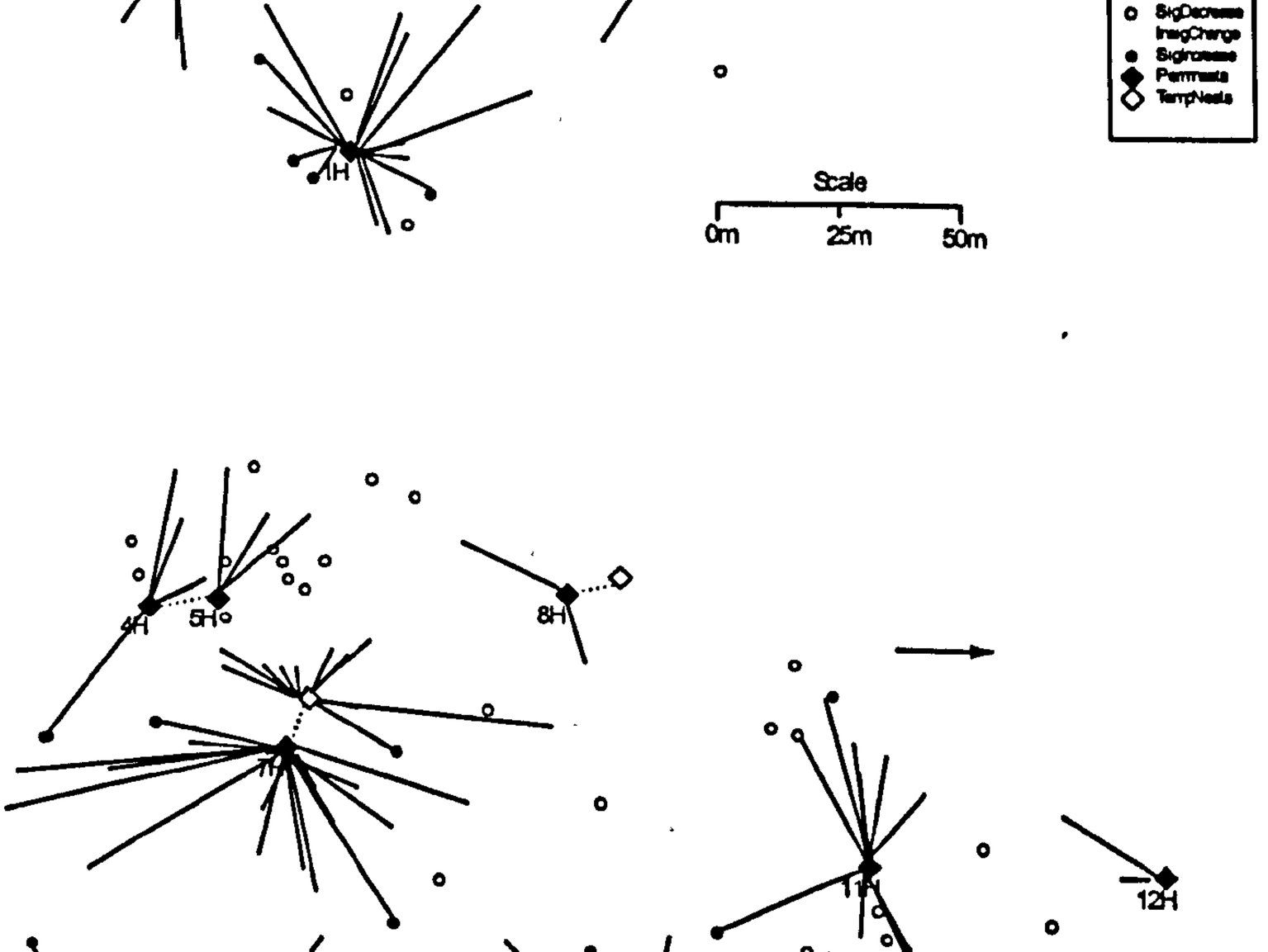


Figure G.11: Difference in foraging activity between different years for Halse whole site counts a) 19/07/95 with 24/06/96 b) 24/06/96 with 19/07/95

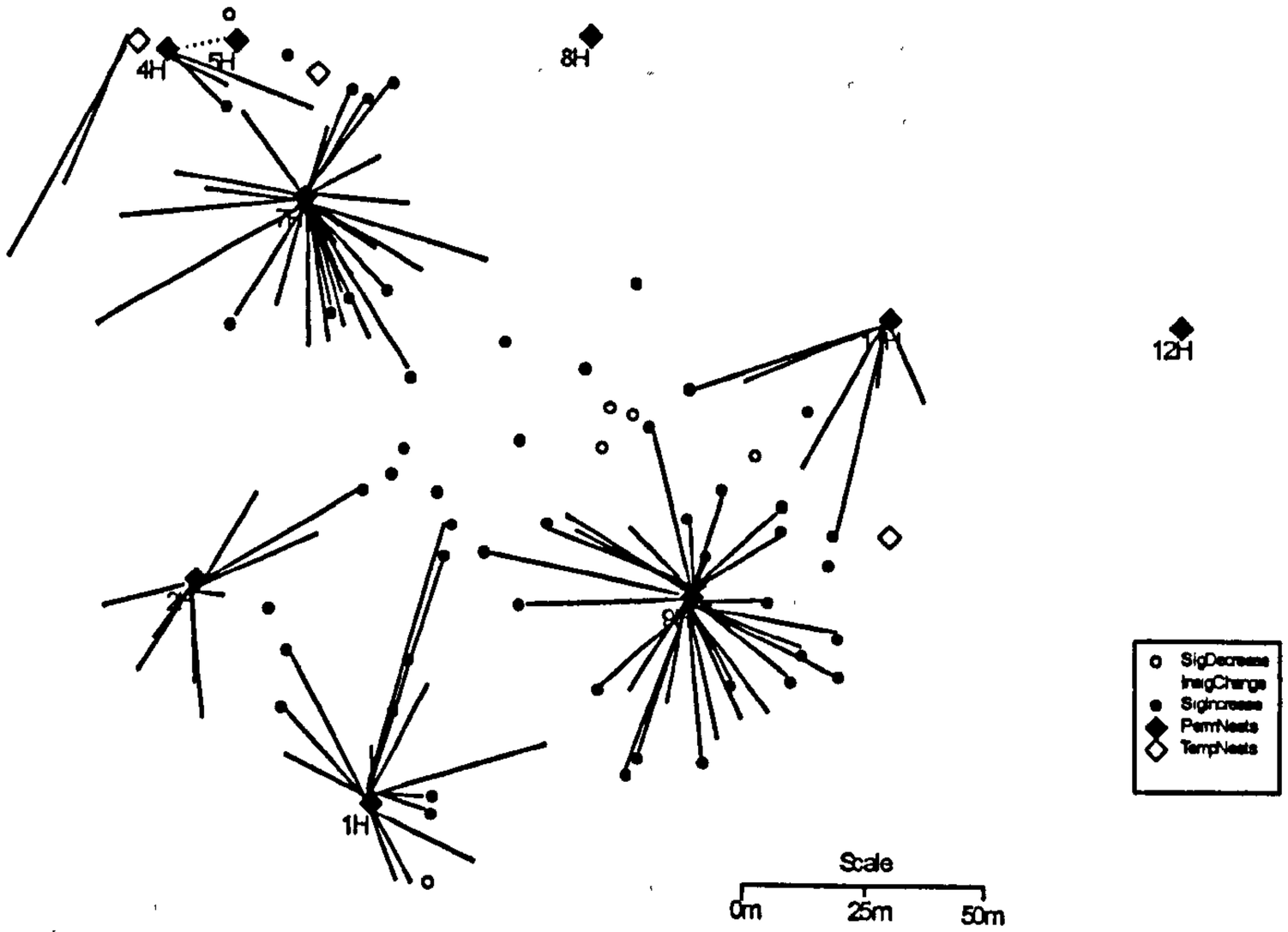
a)



b)

Figure G.12: Difference in foraging activity between different years for Halse whole site counts a) 07/94 with 24/06/96 b) 24/06/96 with 07/94

a)



b)

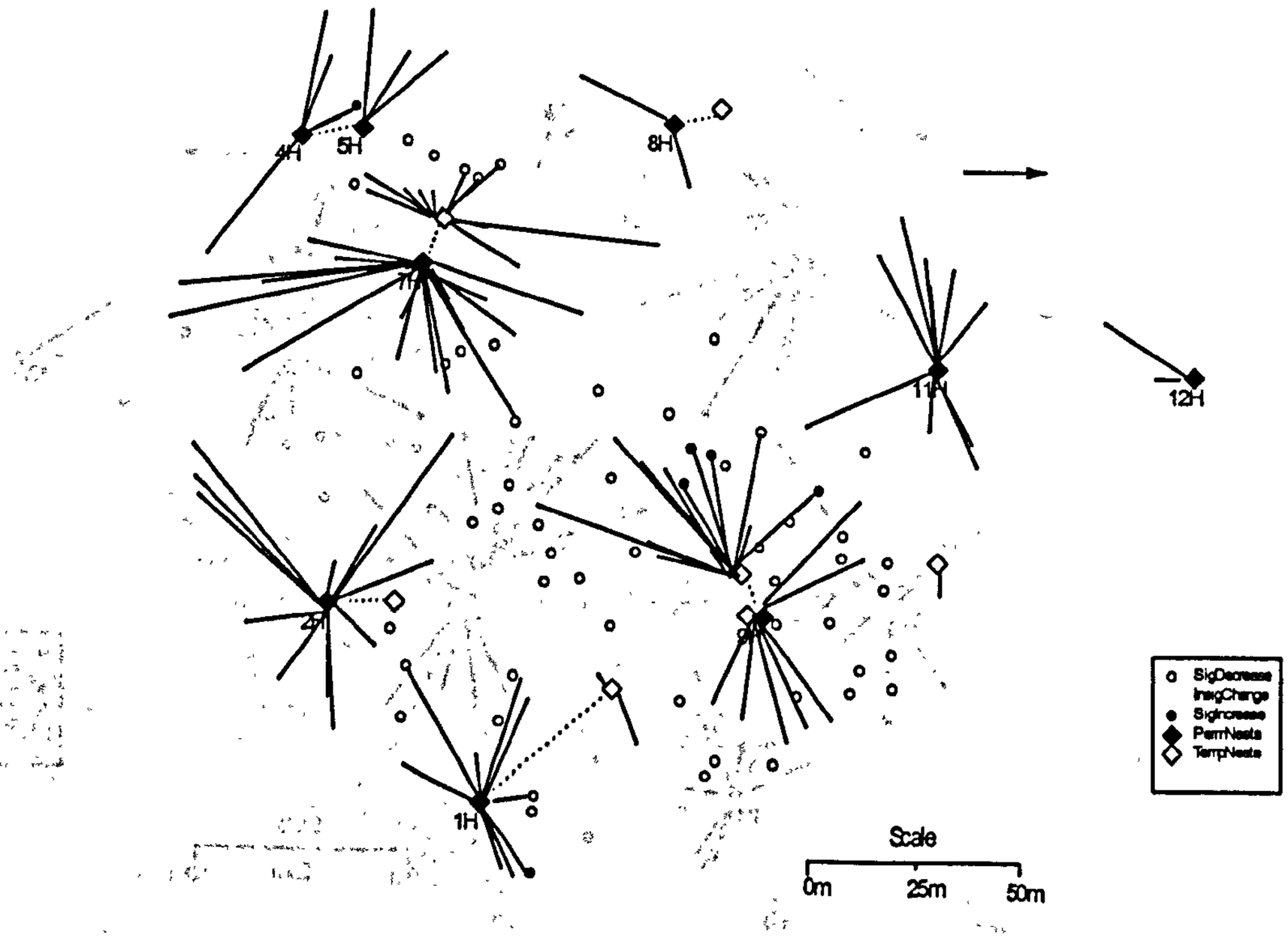
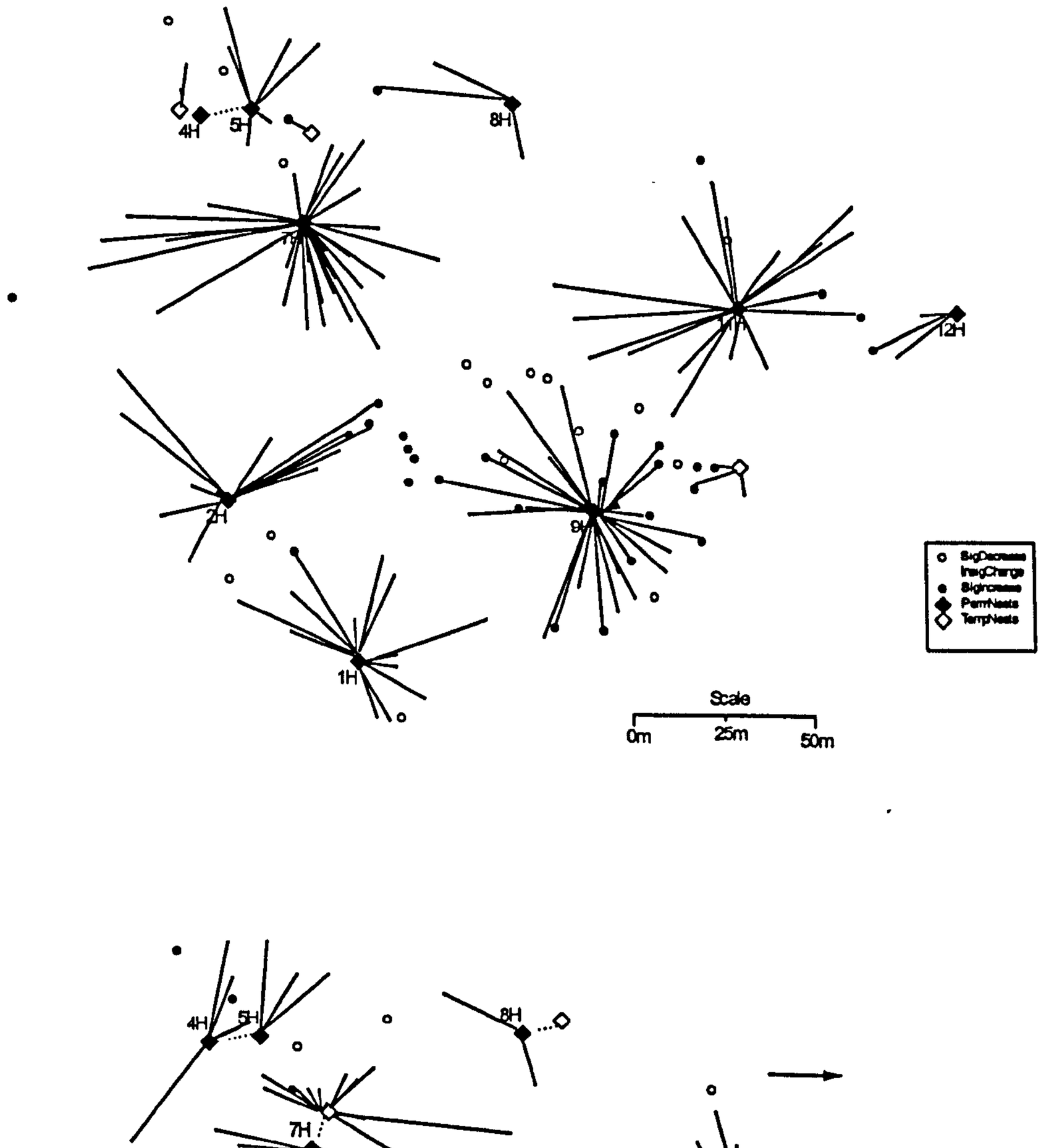


Figure G.13: Difference in foraging activity between different years for Halse whole site counts a) 16/08/94 with 24/06/96 b) 24/06/96 with 16/08/94

a)



b)

Appendix H: Weight and head width of *Formica rufa* ascending and descending oak trees on 8th May 1996

Blue 319	Ascending			Descending		
Sample number (far tree)	Weight / g	Head width relative units	Head width / mm	Weight / g	Head width / relative units	Head width / mm
1	0.0065	6.74	1.668	0.0022	4.89	1.210
2	0.0074	7.48	1.851	0.0024	5.2	1.287
3	0.0045	6.64	1.644	0.0073	6.84	1.693
4	0.0084	7.55	1.869	0.0076	6.65	1.646
5	0.0101	7.59	1.879	0.0075	6.77	1.676
6	0.0054	6.31	1.562	0.0067	7.16	1.772
7	0.0055	6.14	1.520	0.0080	7.25	1.795
8	0.0058	5.59	1.384	0.0092	5.64	1.396
9	0.0052	5.27	1.304	0.0094	6.56	1.624
10	0.0067	5.82	1.441	0.0020	4.98	1.233
11	0.0089	6.38	1.579	0.0082	6.45	1.597
12	0.0068	6.29	1.557	0.0074	6.98	1.728
13	0.0064	6.28	1.554	0.0084	7	1.733
14	0.0026	4.7	1.163	0.0074	6.7	1.658
15	0.0045	6.45	1.597	0.0106	7.2	1.782
16	0.0046	6.59	1.631	0.0068	6.34	1.569
17	0.0033	6.79	1.681	0.0075	6.91	1.710
18	0.0033	5.8	1.436	0.0067	5.82	1.441
19	0.0115	7.16	1.772	0.0097	7.2	1.782
20	0.0067	6.89	1.705	0.0154	7.86	1.946
21	0.0086	7.24	1.792	0.0142	6.77	1.676
22	0.0128	7.15	1.770	0.0072	6.3	1.559
23	0.0074	6.9	1.708	0.0077	6.81	1.686
24	0.0099	7.28	1.802	0.0122	7.11	1.760
25	0.0049	6.19	1.532	0.0044	5.94	1.470
26	0.0062	6.02	1.490	0.0058	6.6	1.634
27	0.0095	6.42	1.589	0.0085	6.77	1.676
28	0.0095	7.26	1.797	0.0090	6.81	1.686
29	0.0096	7.24	1.792	0.0069	7.14	1.767
30	0.0079	6.6	1.634	0.0087	6.54	1.619
31	0.0065	6.5	1.609	0.0062	6.04	1.495
32	0.0032	4.94	1.223	0.0087	6.97	1.725
33	0.0081	7.18	1.777	0.0099	7.35	1.819
34	0.0044	5.75	1.423	0.0057	6.02	1.490
35	0.0026	4.64	1.149	0.0112	6.84	1.693
36	0.0079	6.42	1.589	0.0078	7.14	1.767
37	0.0087	6.33	1.567	0.0038	4.9	1.213
38	0.0050	5.55	1.374	0.0065	6.59	1.631
39	0.0059	6	1.485	0.0048	5.4	1.337
40	0.0099	6.7	1.658	0.0074	6.17	1.527
41	0.0080	7.33	1.814	0.0033	5.1	1.262
42	0.0107	7.47	1.849	0.0064	5.78	1.431
43	0.0060	5.98	1.480	0.0075	6.51	1.611
44	0.0060	6.55	1.621	0.0082	6.66	1.649
45	0.0068	6.79	1.681	0.0113	6.71	1.661
46	0.0063	6.67	1.651	0.0069	6.66	1.649
47	0.0093	7.57	1.874	0.0055	5.96	1.475
48	0.0023	5.5	1.361	0.0072	6.74	1.668
49	0.0072	6.44	1.594	0.0080	6.33	1.567
50	/	/	/	0.0068	6.22	1.540

Blue 320	Ascending			Descending		
Sample number (far tree)	Weight / g	Head width relative units	Head width / mm	Weight / g	Head width / relative units	Head width / mm
1	0.0042	5.37	1.329	0.0126	7.29	1.804
2	0.0037	6.07	1.502	0.0097	7.43	1.839
3	0.0053	5.95	1.473	0.0098	6.42	1.589
4	0.0033	4.7	1.163	0.0061	5.85	1.448
5	0.0062	6.25	1.547	0.0063	6.41	1.587
6	0.0028	5.1	1.262	0.0075	6.03	1.493
7	0.0049	6.25	1.547	0.0069	6.47	1.601
8	0.0036	6.27	1.552	0.0087	7.41	1.834
9	0.0058	6.67	1.651	0.0084	7.28	1.802
10	0.0100	7.1	1.757	0.0107	7.19	1.780
11	0.0058	6.7	1.658	0.0060	7.27	1.800
12	0.0070	6.24	1.545	0.0046	6.26	1.550
13	0.0054	6.39	1.582	0.0103	7.28	1.802
14	0.0101	6.64	1.644	0.0066	7.2	1.782
15	0.0098	6.66	1.649	0.0065	6.4	1.584
16	0.0087	6.1	1.510	0.0105	7.56	1.871
17	0.0055	6.06	1.500	0.0083	7.32	1.812
18	0.0073	7.47	1.849	0.0050	4.89	1.210
19	0.0034	6.32	1.564	0.0059	6.26	1.550
20	0.0077	6.6	1.634	0.0080	6.91	1.710
21	0.0052	5.73	1.418	0.0138	6.22	1.540
22	0.0063	6.88	1.703	0.0084	6.59	1.631
23	0.0076	6.12	1.515	0.0076	6.71	1.661
24	0.0088	6.45	1.597	0.0120	6.76	1.673
25	0.0051	7.16	1.772	0.0066	/	/
26	0.0085	6.9	1.708	0.0122	6.77	1.676
27	0.0056	6.8	1.683	0.0092	6.75	1.671
28	0.0082	6.19	1.532	0.0013	6.91	1.710
29	0.0061	7.14	1.767	0.0074	7.57	1.874
30	0.0063	6.12	1.515	0.0068	6.8	1.683
31	0.0087	7.27	1.800	0.0085	6.25	1.547
32	0.0046	6	1.485	0.0101	7.27	1.800
33	0.0078	6.72	1.663	0.0079	6.05	1.498
34	0.0070	6.64	1.644	0.0078	6.8	1.683
35	0.0127	7.98	1.975	0.0087	6.85	1.696
36	0.0061	6.18	1.530	0.0105	7.8	1.931
37	0.0078	6.62	1.639	0.0080	6.85	1.696
38	0.0055	6.05	1.498	0.0066	5.72	1.416
39	0.0051	6.53	1.616	0.0062	6.05	1.498
40	0.0077	7.38	1.827	0.0071	6.66	1.649
41	0.0076	6.74	1.668	0.0088	6.75	1.671
42	0.0071	6.25	1.547	0.0062	6.44	1.594
43	0.0043	5.95	1.473	0.0046	6.38	1.579
44	0.0040	6.39	1.582	0.0027	5.04	1.248
45	0.0052	6.74	1.668	0.0077	6.58	1.629
46	0.0036	5.32	1.317	0.0051	7.22	1.787
47	0.0036	6.1	1.510	0.0083	7.11	1.760
48	0.0041	6.57	1.626	0.0070	6.79	1.681
49	0.0048	6.05	1.498	0.0069	7.16	1.772
50	0.0069	7.02	1.738	/	/	/

Red 70	Ascending			Descending		
Sample number (near tree)	Weight / g	Head width relative units	Head width / mm	Weight / g	Head width / relative units	Head width / mm
1	0.0081	6.43	1.592	0.0070	6.75	1.671
2	0.0049	6.9	1.708	0.0061	7.26	1.797
3	0.0045	5.45	1.349	0.0053	5.92	1.465
4	0.0065	6.04	1.495	0.0037	5.23	1.295
5	0.0034	5.8	1.436	0.0022	5	1.238
6	0.0050	6.55	1.621	0.0065	7.53	1.864
7	0.0046	5.44	1.347	0.0076	6.7	1.658
8	0.0065	7.82	1.936	0.0067	7.41	1.834
9	0.0053	6.37	1.577	0.0030	5.27	1.304
10	0.0040	5.3	1.312	0.0062	7.62	1.886
11	0.0042	6.34	1.569	0.0051	6.97	1.725
12	0.0031	6.05	1.498	0.0048	6.12	1.515
13	0.0102	7.12	1.762	0.0045	6.86	1.698
14	0.0024	5.91	1.463	0.0043	6.03	1.493
15	0.0055	6.75	1.671	0.0059	6.9	1.708
16	0.0039	6.3	1.559	0.0046	6.39	1.582
17	0.0064	6.95	1.720	0.0067	6.07	1.502
18	0.0055	6.78	1.678	0.0094	7.26	1.797
19	0.0064	5.76	1.426	0.0041	4.63	1.146
20	0.0054	6.19	1.532	0.0032	5.1	1.262
21	0.0040	6.14	1.520	0.0071	6.72	1.663
22	0.0069	6.37	1.577	0.0072	6.88	1.703
23	0.0066	6.25	1.547	0.0030	5.12	1.267
24	0.0018	4.75	1.176	0.0042	6.17	1.527
25	0.0078	7	1.733	0.0041	6.32	1.564
26	0.0056	6.74	1.668	0.0061	6.56	1.624
27	0.0059	6.41	1.587	0.0058	6.62	1.639
28	0.0051	6.65	1.646	0.0059	6.86	1.698
29	0.0035	5.45	1.349	0.0064	6.92	1.713
30	0.0033	5.1	1.262	0.0057	6.71	1.661
31	0.0020	4.42	1.094	0.0052	6.57	1.626
32	0.0056	6.16	1.525	0.0058	5.81	1.438
33	0.0086	6.51	1.611	0.0071	6.59	1.631
34	0.0061	7.02	1.738	0.0080	7.26	1.797
35	0.0038	6.92	1.713	0.0066	6.77	1.676
36	0.0031	6.09	1.507	0.0065	6.65	1.646
37	0.0071	6.61	1.636	0.0041	5.91	1.463
38	0.0052	5.31	1.314	0.0048	5.88	1.455
39	0.0063	6.45	1.597	0.0054	5.56	1.376
40	0.0025	5.08	1.257	0.0053	6.14	1.520
41	0.0092	6.94	1.718	0.0067	6.6	1.634
42	0.0061	6.18	1.530	0.0071	6.03	1.493
43	0.0033	5.05	1.250	0.0042	6.7	1.658
44	0.0053	6.2	1.535	0.0055	6.37	1.577
45	0.0048	5.02	1.243	0.0036	5.3	1.312
46	0.0053	5.95	1.473	0.0059	6.49	1.606
47	0.0032	5.45	1.349	0.0046	5.69	1.408
48	0.0071	5.93	1.468	0.0044	6.4	1.584
49	0.0033	4.71	1.166	0.0058	7.3	1.807
50	0.0047	5.66	1.401	0.0057	6.16	1.525

Red 60	Ascending			Descending		
Sample number (near tree)	Weight / g	Head width relative units	Head width / mm	Weight / g	Head width / relative units	Head width / mm
1	0.0040	5.25	1.300	0.0083	6	1.485
2	0.0137	6.38	1.579	0.0082	6.6	1.634
3	0.0046	5.15	1.275	0.0120	7.15	1.770
4	0.0081	7	1.733	0.0091	6.75	1.671
5	0.0063	5.65	1.399	0.0046	5.52	1.366
6	0.0089	6.95	1.720	0.0115	6.81	1.686
7	0.0072	6.5	1.609	0.0042	5.05	1.250
8	0.0068	5.65	1.399	0.0072	6.21	1.537
9	0.0055	5.65	1.399	0.0079	6.47	1.601
10	0.0076	6.93	1.715	0.0050	5.22	1.292
11	0.0066	6.5	1.609	0.0074	6.28	1.554
12	0.0077	7	1.733	0.0075	6.9	1.708
13	0.0052	7	1.733	0.0055	6.35	1.572
14	0.0080	7.07	1.750	0.0048	5.41	1.339
15	0.0071	5.92	1.465	0.0055	5.54	1.371
16	0.0052	6.52	1.614	0.0063	5.81	1.438
17	0.0094	7.75	1.918	0.0048	4.82	1.193
18	0.0063	6.13	1.517	0.0057	5.57	1.379
19	0.0040	4.76	1.178	0.0074	6.48	1.604
20	0.0056	6	1.485	0.0082	7.05	1.745
21	0.0065	5.71	1.413	0.0045	6.75	1.671
22	0.0057	5.4	1.337	0.0076	6.56	1.624
23	0.0038	5.41	1.339	0.0093	7.05	1.745
24	0.0032	5.82	1.441	0.0052	5.2	1.287
25	0.0032	4.35	1.077	0.0067	5.82	1.441
26	0.0056	5.62	1.391	0.0064	6.53	1.616
27	0.0055	6.18	1.530	0.0025	5.2	1.287
28	0.0068	6.5	1.609	0.0032	4.61	1.141
29	0.0069	5.55	1.374	0.0045	6.81	1.686
30	0.0042	5.23	1.295	0.0067	6.32	1.564
31	0.0054	5.25	1.300	0.0073	6.28	1.554
32	0.0072	7.11	1.760	0.0064	5.6	1.386
33	0.0050	5.16	1.277	0.0060	6.29	1.557
34	0.0080	5.6	1.386	0.0049	5.75	1.423
35	0.0043	5.6	1.386	0.0086	6.43	1.592
36	0.0070	7.02	1.738	0.0105	6.8	1.683
37	0.0035	4.8	1.188	0.0074	5.38	1.332
38	0.0052	5.15	1.275	0.0032	4.92	1.218
39	0.0061	6.13	1.517	0.0119	6.4	1.584
40	0.0099	7.27	1.800	0.0049	5.69	1.408
41	0.0060	6.12	1.515	0.0071	6.31	1.562
42	0.0053	6.71	1.661	0.0116	6.25	1.547
43	0.0018	4.5	1.114	0.0045	5.15	1.275
44	0.0136	6.85	1.696	0.0117	7.15	1.770
45	0.0042	5.13	1.270	0.0096	7.49	1.854
46	0.0055	5.21	1.290	0.0055	5.15	1.275
47	0.0049	5.5	1.361	0.0048	6.41	1.587
48	0.0073	6.35	1.572	0.0072	6.25	1.547
49	0.0086	6.16	1.525	0.0079	5.91	1.463
50	0.0071	6.2	1.535	0.0073	6.24	1.545

Appendix I: Weight and head width of *Formica rufa* ascending and descending oak trees on 10th July 1996

Blue 331	Ascending			Descending		
Sample number (far tree)	Weight / g	Head width relative units	Head width / mm	Weight / g	Head width / relative units	Head width / mm
1	0.0056	7.05	1.745	0.0087	6	1.485
2	0.0077	6.16	1.525	0.0087	6.67	1.651
3	0.0060	6.53	1.616	0.0082	6.59	1.631
4	0.0043	5.61	1.389	0.0101	7	1.733
5	0.0048	6.27	1.552	0.0127	7.15	1.770
6	0.0031	5.74	1.421	0.0114	6.5	1.609
7	0.0049	4.77	1.181	0.0070	5.45	1.349
8	0.0101	6.69	1.656	0.0069	5.67	1.403
9	0.0073	6.67	1.651	0.0055	6.03	1.493
10	0.0056	6.55	1.621	0.0082	5.92	1.465
11	0.0053	6.27	1.552	0.0089	6.31	1.562
12	0.0091	6.75	1.671	0.0058	5.9	1.460
13	0.0035	5.55	1.374	0.0046	6.95	1.720
14	0.0016	4.18	1.035	0.0125	6.65	1.646
15	0.0097	7.27	1.800	0.0105	6.55	1.621
16	0.0031	6.3	1.559	0.0039	6.49	1.606
17	0.0073	6.17	1.527	0.0041	6	1.485
18	0.0057	6.82	1.688	0.0049	5.8	1.436
19	0.0040	6.2	1.535	0.0148	7.16	1.772
20	0.0112	7.11	1.760	0.0065	5.66	1.401
21	0.0045	7.23	1.790	0.0054	5.78	1.431
22	0.0084	7.39	1.829	0.0082	6.48	1.604
23	0.0050	6.65	1.646	0.0102	6.24	1.545
24	0.0045	6.79	1.681	0.0079	7.13	1.765
25	0.0046	5.9	1.460	0.0076	6.24	1.545
26	0.0058	5.78	1.431	0.0053	6.75	1.671
27	0.0036	6.08	1.505	0.0086	6.32	1.564
28	0.0066	6.27	1.552	0.0070	6	1.485
29	0.0095	6.67	1.651	0.0109	7.21	1.785
30	0.0087	5.32	1.317	0.0083	6.45	1.597
31	0.0050	4.72	1.168	0.0028	4.95	1.225
32	0.0104	6.42	1.589	0.0122	6.71	1.661
33	0.0062	5.15	1.275	0.0088	7.34	1.817
34	0.0079	6.96	1.723	0.0065	6.84	1.693
35	0.0090	6.06	1.500	0.0119	7.06	1.748
36	0.0063	6.28	1.554	0.0068	5.95	1.473
37	0.0044	5.42	1.342	0.0099	6.45	1.597
38	0.0110	6.61	1.636	0.0082	6.5	1.609
39	0.0083	6.62	1.639	0.0110	6.62	1.639
40	0.0058	4.24	1.050	0.0029	6.26	1.550
41	0.0034	5.79	1.433	0.0048	6.33	1.567
42	0.0125	6.82	1.688	0.0057	5.53	1.369
43	0.0024	5.53	1.369	0.0052	6.6	1.634
44	0.0068	5.31	1.314	0.0059	7.3	1.807
45	0.0065	4.99	1.235	0.0073	6.19	1.532
46	0.0065	6.49	1.606	0.0091	7.46	1.847
47	0.0051	5.83	1.443	0.0083	6.29	1.557
48	0.0031	5.03	1.245	0.0150	7	1.733
49	0.0069	6.82	1.688	0.0098	5.5	1.361
50	0.0083	6.1	1.510	0.0083	5.7	1.411

Appendix I: Weight and head width of *Formica rufa* ascending and descending oak trees on 10th July 1996

Blue 340	Ascending			Descending		
Sample number (far tree)	Weight / g	Head width relative units	Head width / mm	Weight / g	Head width / relative units	Head width / mm
1	0.0033	7.05	1.745	0.0029	7	1.733
2	0.0042	6.8	1.683	0.0034	5.36	1.327
3	0.0067	6.11	1.512	0.0030	6.85	1.696
4	0.0034	7	1.733	0.0039	6.87	1.700
5	0.0020	5.16	1.277	0.0062	7.5	1.856
6	0.0036	6.95	1.720	0.0028	6.75	1.671
7	0.0019	5.24	1.297	0.0031	6.65	1.646
8	0.0080	6.75	1.671	0.0122	6.5	1.609
9	0.0046	6.87	1.700	0.0050	5.15	1.275
10	0.0024	5	1.238	0.0033	6.87	1.700
11	0.0044	6.98	1.728	0.0015	5	1.238
12	0.0055	6.1	1.510	0.0048	6.95	1.720
13	0.0026	6.15	1.522	0.0024	5.8	1.436
14	0.0031	6.25	1.547	0.0053	6.75	1.671
15	0.0032	6.5	1.609	0.0069	6.8	1.683
16	0.0038	5.41	1.339	0.0058	5.42	1.342
17	0.0024	5.05	1.250	0.0021	5.48	1.356
18	0.0025	5.72	1.416	0.0027	6	1.485
19	0.0045	5.79	1.433	0.0036	6.8	1.683
20	0.0083	6	1.485	0.0037	6.18	1.530
21	0.0026	6.08	1.505	0.0032	5.42	1.342
22	0.0026	5.02	1.243	0.0041	6.95	1.720
23	0.0045	6.05	1.498	0.0041	6.75	1.671
24	0.0035	7	1.733	0.0028	5.79	1.433
25	0.0051	7.3	1.807	0.0095	6.52	1.614
26	0.0033	6.59	1.631	0.0065	6.41	1.587
27	0.0033	6.55	1.621	0.0033	6.75	1.671
28	0.0021	5	1.238	0.0082	6.83	1.691
29	0.0023	6.1	1.510	0.0088	6.97	1.725
30	0.0026	5.95	1.473	0.0081	6.7	1.658
31	0.0039	5.35	1.324	0.0043	6.65	1.646
32	0.0062	5.4	1.337	0.0074	6.71	1.661
33	0.0066	6.25	1.547	0.0021	5.02	1.243
34	0.0042	6.5	1.609	0.0058	7.21	1.785
35	0.0023	5.86	1.450	0.0077	6.5	1.609
36	0.0028	6.32	1.564	0.0034	6.86	1.698
37	0.0025	5	1.238	0.0041	6.95	1.720
38	0.0024	6.05	1.498	0.0047	6.08	1.505
39	0.0042	6.78	1.678	0.0062	7.21	1.785
40	0.0092	6.15	1.522	0.0098	6.17	1.527
41	0.0043	7.1	1.757	0.0057	6.45	1.597
42	0.0055	6.52	1.614	0.0055	5.61	1.389
43	0.0035	6.09	1.507	0.0071	6	1.485
44	0.0024	6.22	1.540	0.0029	5	1.238
45	0.0025	5.5	1.361	0.0036	7.05	1.745
46	0.0021	5.69	1.408	0.0060	6.95	1.720
47	0.0032	6.45	1.597	0.0036	6.58	1.629
48	0.0020	5.45	1.349	0.0080	6.95	1.720
49	0.0026	5.55	1.374	0.0028	5.25	1.300
50	0.0036	6.6	1.634	0.0030	5.25	1.300

Red 70	Ascending			Descending		
Sample number (near tree)	Weight / g	Head width relative units	Head width / mm	Weight / g	Head width / relative units	Head width / mm
1	0.0032	5.6	1.386	0.0091	6.3	1.559
2	0.0019	6	1.485	0.0074	6.35	1.572
3	0.0036	5	1.238	0.0095	6.25	1.547
4	0.0049	5.96	1.475	0.0084	5.6	1.386
5	0.0025	5.65	1.399	0.0036	4.92	1.218
6	0.0036	4.61	1.141	0.0078	5.21	1.290
7	0.0012	4.54	1.124	0.0051	5	1.238
8	0.004	5.17	1.280	0.0082	6.78	1.678
9	0.0031	5.67	1.403	0.0027	4.4	1.089
10	0.0028	5.55	1.374	0.0047	5.33	1.319
11	0.0053	6.91	1.710	0.0032	4.5	1.114
12	0.0032	7	1.733	0.0027	4.6	1.139
13	0.0042	5.45	1.349	0.004	5.15	1.275
14	0.0041	4.91	1.215	0.0026	4.54	1.124
15	0.0016	4.62	1.144	0.0067	5.44	1.347
16	0.0045	4.84	1.198	0.0031	4.74	1.173
17	0.0065	5.61	1.389	0.0055	6.19	1.532
18	0.0037	4.9	1.213	0.0039	5	1.238
19	0.0042	5.7	1.411	0.008	5.5	1.361
20	0.0065	5.65	1.399	0.0055	5.41	1.339
21	0.0028	6.24	1.545	0.0072	5.62	1.391
22	0.0049	5.45	1.349	0.0024	5.54	1.371
23	0.0058	5.5	1.361	0.0073	5.5	1.361
24	0.0042	5.25	1.300	0.0063	5.72	1.416
25	0.0024	4.5	1.114	0.0062	4.75	1.176
26	0.0045	5.44	1.347	0.0052	4.91	1.215
27	0.0016	4.5	1.114	0.0062	6.85	1.696
28	0.0037	7.19	1.780	0.0028	5.08	1.257
29	0.0037	5.6	1.386	0.0054	4.56	1.129
30	0.0056	6.25	1.547	0.0057	5	1.238
31	0.0032	6.56	1.624	0.0092	5.59	1.384
32	0.0051	6.45	1.597	0.0053	4.95	1.225
33	0.0077	6.5	1.609	0.0052	4.9	1.213
34	0.0028	5.4	1.337	0.0099	6.3	1.559
35	0.0044	4.9	1.213	0.0028	4.49	1.111
36	0.0061	5.45	1.349	0.0045	4.29	1.062
37	0.0038	5.64	1.396	0.007	6.05	1.498
38	0.0027	6	1.485	0.003	4.67	1.156
39	0.0014	4.7	1.163	0.0072	5.9	1.460
40	0.0011	4.25	1.052	0.0064	4.93	1.220
41	0.0043	6.32	1.564	0.0081	5.46	1.351
42	0.0034	5.28	1.307	0.0055	4.7	1.163
43	0.0036	4.72	1.168	0.0073	5.42	1.342
44	0.0035	4.7	1.163	0.0058	6.33	1.567
45	0.0026	4.95	1.225	0.006	5.63	1.394
46	0.0024	5.15	1.275	0.0044	4.3	1.064
47	0.0023	5.95	1.473	0.0075	5.18	1.282
48	0.0036	4.55	1.126	0.0053	6.15	1.522
49	0.0045	5.15	1.275	0.004	4.96	1.228
50	0.0043	7.25	1.795	0.0029	4.65	1.151

Appendix I: Weight and head width of *Formica rufa* ascending and descending oak trees on 10th July 1996

Red 44	Ascending			Descending		
Sample number (near tree)	Weight / g	Head width relative units	Head width / mm	Weight / g	Head width / relative units	Head width / mm
1	0.0037	6.1	1.510	0.0031	5.5	1.361
2	0.0027	5.55	1.374	0.0028	4.95	1.225
3	0.0027	5.64	1.396	0.0022	5.3	1.312
4	0.0025	5.61	1.389	0.0053	5.64	1.396
5	0.0015	4.5	1.114	0.0025	5.2	1.287
6	0.0048	6.07	1.502	0.0056	6.07	1.502
7	0.0014	5	1.238	0.0043	5.22	1.292
8	0.0039	7.3	1.807	0.0012	4.55	1.126
9	0.0017	5.2	1.287	0.0026	5.55	1.374
10	0.0012	4.9	1.213	0.0034	5.18	1.282
11	0.0054	5.45	1.349	0.0025	6.05	1.498
12	0.0047	5.32	1.317	0.0019	5.99	1.483
13	0.0030	6.49	1.606	0.0034	6.2	1.535
14	0.0028	6.36	1.574	0.0028	5.75	1.423
15	0.0032	5.98	1.480	0.0021	6.82	1.688
16	0.0014	5.25	1.300	0.0038	5.5	1.361
17	0.0020	5.45	1.349	0.0022	4.95	1.225
18	0.0023	4.12	1.020	0.0017	5.65	1.399
19	0.0039	5.25	1.300	0.0030	4.95	1.225
20	0.0038	6	1.485	0.0061	5.64	1.396
21	0.0014	4.65	1.151	0.0024	5.62	1.391
22	0.0018	4.02	0.995	0.0024	4.64	1.149
23	0.0020	5.52	1.366	0.0047	5	1.238
24	0.0055	6	1.485	0.0033	4.89	1.210
25	0.0015	5.15	1.275	0.0023	6.19	1.532
26	0.0031	5.5	1.361	0.0072	5	1.238
27	0.0033	5.82	1.441	0.0022	5.32	1.317
28	0.0013	4.97	1.230	0.0043	5.05	1.250
29	0.0063	6.25	1.547	0.0027	5.9	1.460
30	0.0047	6.21	1.537	0.0024	4.95	1.225
31	0.0017	5.02	1.243	0.0012	6.25	1.547
32	0.0027	5.95	1.473	0.0039	5.45	1.349
33	0.0033	6.15	1.522	0.0046	5.5	1.361
34	0.0016	5.94	1.470	0.0045	4.25	1.052
35	0.0025	5.7	1.411	0.0012	4.7	1.163
36	0.0017	5.27	1.304	0.0032	5	1.238
37	0.0014	5.12	1.267	0.0017	4.4	1.089
38	0.0033	5.44	1.347	0.0017	5	1.238
39	0.0023	6.25	1.547	0.0044	5.45	1.349
40	0.0029	5.85	1.448	0.0029	6.1	1.510
41	0.0024	4.85	1.200	0.0031	5.5	1.361
42	0.0027	4.75	1.176	0.0033	5.48	1.356
43	0.0044	4.96	1.228	0.0019	5.25	1.300
44	0.0043	6.25	1.547	0.0025	4.95	1.225
45	0.0023	6	1.485	0.0032	6.7	1.658
46	0.0029	5.43	1.344	0.0029	6.27	1.552
47	0.0029	4.55	1.126	0.0025	6.15	1.522
48	0.0023	4.97	1.230	0.0037	6.44	1.594
49	0.0018	5.48	1.356	0.0013	4.55	1.126
50	0.0016	5	1.238	0.0035	4.82	1.193

Appendix J: Description of area surrounding each pitfall trap

Dimsdale

Trap Number	Distance /m	Nearest Nest	Distance from nearest nest /m	Description
	0	10D	0	Nest 10D (no trap)
1	5	10D	5	open, moss, bare earth, few leaves, some shade
2	10	10D	10	open, moss, bare earth, few leaves and twigs, some shade
3	15	10D	15	open, moss, bare earth, few leaves and twigs, some shade
4	20	10D	20	open, moss, bare earth, few leaves and twigs, some shade, near low tree stump
5	25	10D	25	open, earth covered with leaves and twigs, some shade
6	30	10D	30	open, earth, moss, leaves and twigs, some shade
7	35	10D	35	close to tree, moss, shade
8	40	10D	40	open, earth, leaves, shade
9	45	6D	43.2	open, earth, leaves, shade
10	50	6D	38.1	open, moss, few leaves, shade
11	55	6D	33.4	open, earth, lots of leaves, shade
12	60	6D	28.1	open, earth, few leaves and twigs, some shade
13	65	6D	23.4	open, earth, few leaves and twigs, some shade
14	70	6D	17.8	open, earth, few leaves and twigs, some shade
15	75	6D	13.9	open, earth, few leaves and twigs, shade
16	80	6D	8.3	open, earth, few leaves and twigs, little shade
17	85	6D	4.6	leaves, surrounded by heather, some shade
18	90	6D	3.5	deep leaves, edge of heather, little shade
19	95	6D	7.8	was covered by rodies, completely shaded, until June 1996, when they were cut. Now leaves and very open, no shade

Dimsdale continued

Trap Number	Distance /m	Nearest Nest	Distance from nearest nest /m	Description
20	100	5D	10.35	some leaves over earth, edge of heather, some shade
21	105	5D	8.7	open, moss, shade
22	110	2D	10	open, leaves over earth, shade
23	115	2D	5	deep leaves, under shade of heather, shade
24	120	2D	0	open, edge of nest, leaves

Halse

Trap Number	Distance /m	Nearest Nest	Distance from nearest nest /m	Description
	0	9H	0	Nest 9H (no trap)
1	5	9H	5	open, grass and bare earth, no shade
2	10	9H	10	edge of rodies , leaves, shade
3	15	9H	15	base of heavily foraged tree, open, bare earth, little shade
4	20	9H	20	open, moss, some shade
5	25	9H	25	open, leaves, shade
6	30	9H	30	open, leaves, some shade
7	35	9H	35	open, leaves, some shade
8	40	9H	40	open, some leaves, some shade
9	45	9H	45	open, some leaves, some shade
10	50	7H	45	open, leaves, some shade
11	55	7H	40	open, leaves, some shade
12	60	7H	35	open, leaves, some shade
13	65	7H	30	open, leaves, some shade
14	70	7H	25	open, leaves, some shade
15	75	7H	20	open, some leaves, some shade
16	80	7H	15	open, earth, few leaves and twigs, little shade from bracken
17	85	7H	10	open, earth, few leaves and twigs, little shade
18	90	7H	5	open, earth, little shade
	95	7H	0	Nest 7H (no trap)

Control ants

Trap Number	Distance /m	Distance from nearest nest /m	Description
	0	0	Nest (no trap)
1	5	5	open, leaves, lots of beech nut cases, little shade
2	10	10	open, leaves, lots of beech nut cases, little shade
3	15	15	open, lots of leaves, some shade
4	20	20	open, leaves, earth, shade
5	25	25	open, lots of leaves, shade
6	30	30	open, lots of leaves, some shade
7	35	30	lots of leaves, bracken, shade
8	40	25	lots of leaves, bracken, shade
9	45	20	open, some shade, leaves and earth
10	50	15	few leaves, earth, shaded by holly and bracken
11	55	10	few leaves, bracken, shade
12	60	5	open, leaves, earth, surrounded by twigs, logs and bracken, no shade
	65	0	Nest (no trap)

Control no ants

Trap Number	Distance /m	Description
1	5	lots of leaves, shaded under some holly
2	10	few leaves, open, shade
3	15	few leaves, open, shade
4	20	leaves, open, shade
5	25	lots of leaves, open, shade
6	30	lots of leaves, open, shade
7	35	lots of leaves, open, shade
8	40	lots of leaves, open, shade
9	45	lots of leaves, open, shade, silver birch nearby
10	50	lots of leaves, shade, under little holly
11	55	lots of leaves, lots of holly, shade

Appendix K: Mean invertebrate catch per pitfall trap per day for Dimsdale 1994 to 1996

DIMSDALE		Mean invertebrate catch per trap per day												
23/11/94 - 30/11/94 (7 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11	12
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0.286	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0.714	0.429	0.286	0.286	0.429	1.143	1.714	3.143	0.143	0	0.143	0.857
	Acari	family?	0	0.143	0	0	0.143	0.143	0.143	0.143	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0.286	0.857	0	0.286	1.429	0	0	0.429
	Collembola	Entomobryidae	0.143	0.286	0.286	0.143	0.857	0	2.857	0 571	0.286	0.714	0.286	1.000
		Sminthuridae	0	0.143	0	0.286	0.143	0	0	0.429	0	0	0.143	1.143
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0.143	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0	0	0	0	0	0	0	0	0
		Drosophilidae	0	0	0	0	0	0	0	0	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0.143	0	0	0	0	0	0	0
		family?	0.857	0.143	0.571	0.429	0.429	0 571	0.571	1.286	0.143	0.571	0.429	0.429
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	9.286	11.286	12.571	0.571	0.571	1.000	1.571	0.857	0.143	0.286	0	0.429
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0.143	0	0	0	0.143	0	0	0	0	0
		Staphylinidae	0.571	0.429	0.571	0	0.857	0.429	0.286	0.714	0.143	0.143	0.286	0.429
		Zyras humeralis	0	0	0	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0.143	0.143	0	0	0	0	0	0.143
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0.143	0	0	0	0	0.143	0.143	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0.429	0	0.143	0.286	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

DIMSDALE		Mean invertebrate catch per trap per day											
23/11/94 - 30/11/94 (7 days)		Pitfall trap Number	13	14	15	16	17	18	19	20	21	22	23	24
ARACHNIDA	Araneae	Clubionidae		0	0	0	0	0	0	0	0	0	0	0
		Lycosidae		0	0	0	0	0	0	0	0	0	0	0
		family?		0	0	0	0.286	0.143	0	0.143	0	0.143	0.286	0.143
	Opiliones	Nemastomatidae		0	0	0	0	0	0	0	0	0	0	0
		family?		0.571	1.286	0.429	0.143	0.143	0.143	0.143	1.714	0.429	1.143	0.143
	Acari	family?		0	0	0	0	0.286	0	0	0.714	0	0.143	0
	Pseudoscorpionida	family?		0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae		0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae		0	0	0	0	0	0	0	0	0	0	0
		Oniscidae		0	0	0	0	0	0	0	0	0	0	0
		Philosciidae		0	0	0	0	0	0	0	0	0	0	0
		family?		0.143	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae		0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae		0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae		0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae		0	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae		0	0	0	0	0	0	0	0	0	0	0
	unknown	family?		0	0	0	0	0	0	0	0	0.143	0	0.143
CHILOPODA		Lithobiidae		0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?		0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae		0	0.143	1.429	0.143	0	0.143	0	0.857	0	0	0.143
	Collembola	Entomobryidae		0.571	1.000	0	2.000	0	0.143	0.429	0	0.714	1.000	1.000
		Sminthuridae		0.571	0	0	0	0	0	0	0.143	0	0	0.286
	Dermaptera	Forficulidae		0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae		0	0	0	0	0	0	0	0	0	0	0
		Reduviidae		0	0	0	0	0	0	0	0	0	0	0
		family?		0	0	0	0	0	0.143	0	0	0	0	0
	Thysanoptera	family?		0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae		0	0	0	0	0	0.143	0	0	0	0	0
		leafhoppers		0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)		0	0	0	0	0	0	0	0	0	0	0
		family? (larva)		0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae		0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae		0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)		0	0	0	0	0	0	0	0	0	0	0
		Empididae		0	0	0	0	0	0	0	0	0	0	0
		Phoridae		0	0	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)		0	0	0	0	0	0	0	0	0	0	0
		Drosophilidae		0	0	0	0	0	0	0	0	0	0	0
		Dolichopodidae		0	0	0	0	0	0	0	0	0	0	0
		Syrphidae		0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae		0	0	0	0	0	0	0	0	0	0	0
		Asilidae		0	0	0	0	0	0	0	0	0	0	0
		family?		0.143	0.571	0.143	1.000	0.571	0.714	0	0.714	0.143	0.286	0.571
		family? (larva)		0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea		0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea		0	0	0	0	0	0	0	0	0	0	0
		Vespidae		0	0	0	0	0	0	0	0	0	0	0
		family?		0	0	0	0	0	0	0	0	0	0	0
		Formica rufa		0.429	2.571	0.143	4.571	2.000	2.000	3 286	12.571	12.00	27.143	58.00
		Myrmica ruginodis		0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae		0.143	0	0	0	0	0	0	0	0	0	0
		Staphylinidae		0.571	0.571	1.000	0	0	0	0	0.143	0.429	0.286	0.143
		Zyras humeralis		0	0	0	0	0	0	0	0	0	0	0
		Elateridae		0	0	0	0	0	0	0	0	0	0	0
		Curculionidae		0.143	0.286	0	0	0	0	0	0	0	0	0
		Lucanidae		0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae		0	0	0	0	0	0	0	0	0	0	0
		Tenebnonidae		0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae		0	0	0	0	0	0	0	0	0	0	0
		family?		0	0	0	0	0	0	0	0	0	0	0
		family? (larva)		0.286	0	0	0	0	0	0	0.143	0	0	0
		nymph?		0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?		0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae		0	0.571	0.143	0.286	0	0	0	0	0	0	0
		Helicidae		0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae		0	0	0	0	0	0	0	0	0	0	0

DIMSDALE		Mean invertebrate catch per trap per day												
11/01/95 - 18/01/95 (7 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11	12
ARACHNIDA	Araneae	Clubionidae	0	0	0	0.143	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0.143	0	0	0.857	0.429	0	0	0.143	0
	Acari	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	0	0	0.286	0.143	0.286	0.143	0.857	0	0	0.286	0	0
		Sminthuridae	0	0	0.143	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	1.857	0.143	2.286	0.429	0	1.000	1.143	0	0	1.143	0.429
		Anisopodidae	0.143	0	0	0.143	0	0	0.143	0	0.143	0.143	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0.143	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0.143	0	0	0	0	0	0	0	0	0	0
		Drosophilidae	0	0	0.571	0	0	0	0	0	0	0.286	0.143	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	0	0	0	0	0	0	0	0	0	0	0	0
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Staphylinidae	0	0.286	0.286	0.286	0.143	0	0	0.286	0.429	0	0.286	0
		Zyras humeralis	0	0	0	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0.429	0.143	0	0.143	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0.143	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

DIMSDALE		Mean invertebrate catch per trap per day											
11/01/95 - 18/01/95 (7 days)		Pitfall trap Number	13	14	15	16	17	18	19	20	21	22	23	24
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0.143	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0.143	0	0	0
	Acari	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0.143	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	0	0	0	0	0	0	0	0	0	0	0.143	0.143
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0.429	1.571	0.286	0	0.857	0	0.571	0 429	3.000	0	0.714	0.286
		Anisopodidae	0	0	0	0	0	0	0	0	0	0.143	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0.143	0	0.143	0	0	0	0	0	0	0
		Drosophilidae	0	0	0.429	0	0.143	0	0	0	0.571	0.143	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	0	0	0	0	0.143	0.143	0	0	0	0.286	0.429	0.429
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Staphylinidae	0.429	0.286	0.429	0	0	0	0.143	0	0	0.143	0	0
		Zyras humeralis	0	0	0	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0.286	0	0	0	0	0	0.286	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0.143	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0.143	0	0	0	0	0	0	0	0	0	0	0.143
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

DIMSDALE		Mean invertebrate catch per trap per day												
05/04/95 - 10/04/95 (5 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11	12
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0.4	0.2	0	0.2	0	0	0.2	0.2	0.6
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Acari	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0.6	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0.2	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0.4	0	0	0	0	0	0	0
	Collembola	Entomobryidae	0.4	0.4	1	0.4	0.8	0.2	0	0.6	0.2	0	0	0
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0	0	0	0	0	0	0	0	0
		Drosophilidae	0.4	0	0	0	0	0	0.2	0	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	114.6	277.6	7.8	18.6	1.8	25.6	36.8	39.2	39 2	21	3.4	15.6
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Staphylinidae	0	0	0	0.2	0.4	0	0.2	0	0.2	0	0.2	0.2
		Zyras humeralis	0	0	0	0.2	0	0	0.2	0.2	0	0.4	0	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0.2	0	0	0	0	0.2	0	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0.2	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

DIMSDALE		Mean invertebrate catch per trap per day											
05/04/95 - 10/04/95 (5 days)		Pitfall trap Number	13	14	15	16	17	18	19	20	21	22	23	24
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0.2	0	0	0.6	0.2	0	0.4	0	0	0.4	0.2
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Acari	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0.2	0	0.2	0	0	0	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0.2	0	0.2	0	0	0	0.2
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0.4	0.4	0	0	0	0
	Collembola	Entomobryidae	0	0.6	1.4	0	0	0.2	0.2	0	0	0.4	0.6	0.2
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0.2	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0	0	0	1.2
		Empididae	0	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0.2	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0	0	0	0	0	0	0	0	0
		Drosophilidae	0	0	0	0	0.2	0	0	0	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	67.2	109.8	97.0	217.6	125.0	46.6	13.4	45.8	52.4	39.4	32.0	267.2
		Myrmica ruginodis	0	0	0	0	0 2	0	0.2	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Staphylinidae	0.2	0	0.2	0.2	0.2	0	0.2	0	0	0	0.2	0
		Zyras humeralis	0	0	0	0.2	0	2.2	0.2	0	0	0	0.4	0.4
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0.2	0	0.2	0.2	0	0.2	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0.2	0	0.2	0	0	0.2	0.2	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

DIMSDALE		Mean invertebrate catch per trap per day											
15/05/95 to 19/05/95 (4 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11	12
ARACHNIDA	Araneae	Clubionidae	0	0	0.50	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0.25	0	0.50	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0.50	0	0.50	1.25	1.00	1.25	0	0.50	0.25	0.50
	Acari	family?	0.50	0.50	1.00	1.25	0.25	0	0	0	0	4.50	0.50	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0.50	0.50	0.50	0.25	0	0	0	0	0.50	0.25	0	0
		Oniscidae	0.25	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0.25	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0.25	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0.25	0	0	0	0	0	0.25	0	0.25	0.50	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0.25	0	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	10.75	5.75	5.75	3.25	1.75	0.25	1.50	0.25	2.25	0.25	0.50	0.75
		Sminthuridae	1.75	13.75	3.25	0	0	1.75	0.25	0	0.50	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0.75	0.25	0.25	0.25	0.25	0	0	0	0.50	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0.25	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0.25	0.25	0.25	0	0	0.25	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0.25	0	0.25	0.50	0	0
		Phoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	1.00	0.75	0	0	0	0.25	1.00	0.50	0.50	0.25	0.25
		Drosophilidae	0	0	0	0	0	0	0	0	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0.25	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	320.25	217.50	150.75	57.50	60.50	86.00	6.25	14.75	34.50	32.25	15.25	32.00
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0	0.25
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0	0	0	0.25
		Staphylinidae	0	0	0	0	0.25	0	0	0	0.25	0	0.75	0.25
		Zyras humeralis	0	0	0	0	0	0	0.25	0	0	0	0.75	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0.25	0	0.25	0	0	0	0	0.25	0	0.25	0.25
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0.50	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

DIMSDALE		Mean invertebrate catch per trap per day											
15/05/95 to 19/05/95 (4 days)		Pitfall trap Number	13	14	15	16	17	18	19	20	21	22	23	24
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0.50	0.25	0	0.25	0	0	0.25	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0.25	0	0.75	0.25	0.25	0.25	0.50	0.75	0.50	0	0.25
	Acari	family?	0	2.00	0	0	1.00	3.75	1.00	0	1.25	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0.25	0.25	2.75	0.25	0.25	0	0.25	0.25	0.75	0	0	2.50
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0.25	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0.25	0	0.25	0	0	0	0	0	0	0.25	0.75
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	0.25	0.25	0.50	0	0.25	0.50	0.50	0.75	1.50	4.00	0.75	0.50
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0.25	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0.25	0	0	0	0	0	0	0	0	1.00
		Empididae	0	0	0.25	0	0.25	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0.25	0.75	0.25	0	0.25	0	0	0.50	0.50	0.25	0.25	0
		Drosophilidae	0	0	0	0	0	0	0	0	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0.25	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	34.0	123.0	134.75	202.25	195.75	185.25	4.25	38.00	86.50	125.75	17.75	264.0
		Myrmica ruginodis	0	0	0	0	0.25	0.50	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Staphylinidae	0.25	0	0	0	0	0	0	0	0	0	0	0
		Zyras humeralis	0	0	0	0.25	0.50	1.25	0.25	0	0.25	1.00	0.75	1.00
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0.25	0.25	0	0.50	0.50	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0.25
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

DIMSDALE		Mean invertebrate catch per trap per day												
10/07/95 - 14/07/95 (4 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11	12
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0.25	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0.50	0.75	0	0	0	0	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	1.00	0 25	0	0.25	0.25	0.25
	Acari	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	familyV	0	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	0.50	1.25	6.75	3.75	5.00	0	0.50	2.00	0	0	0.50	0
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0.25	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0.25	0	0	0	0	0.25	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0 25	0.25	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0.25	0	0	0	0.25	0	0.25	0	0	0	0	0
		Drosophilidae	0	0.25	0.50	0.25	0	0	0	0.75	0	0	0.25	0
		Dolichopodidae	0	0	0.25	0	0	0	0	0.25	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0.25	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	312.0	528.0	234.25	195.75	175 25	99.25	136.75	106.75	72.50	46.75	62.75	71.25
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Staphylinidae	0	0	0	0	0.25	0	0.25	0	0	0	0.25	0
		Zyras humeralis	0	0	0	0	0.25	0	0	0.50	0	0	0.25	0.25
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0.25	0.50	0	0	0	0	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0.50	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0.75	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

DIMSDALE		Mean invertebrate catch per trap per day											
10/07/95 - 14/07/95 (4 days)		Pitfall trap Number	13	14	15	16	17	18	19	20	21	22	23	24
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0.25	0	0	0.25	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	1.75	3.50	0	1.25	0.25	0.25	0.25	0	0	0.25	0.75	0
	Acari	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	familyV	0	0	0	0	0	0.25	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0.25	0.50	0.25	0	0.50	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0	0.25
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	1.00	0	0.75	1.25	0.75	0.50	0.25	0	0	0.50	0.25	1.75
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0.25	0	0	0	0.25	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0.75	0	0.25	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0.50	0.75	0	0	0	0	0	0	0	0	0
		Drosophilidae	0.50	0.50	0	0	0 50	0	0	0	0	0.25	0	0
		Dolichopodidae	0	0	0	0	0.25	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0.25	0	0	0	0	0	0	0	0.25
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	134.75	192.0	278.0	154.5	219.5	165.0	142.5	144.75	237.25	332.25	344.5	597.75
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Staphylinidae	0	0.25	0	0	0	0.25	0	0	0	0.25	0	0
		Zyras humeralis	0.25	0.25	0	1.25	1.75	0.25	0	0	0	0	0.25	0.25
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0.25	0	0	0	0	0	0	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0.25	0	0	0	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

DIMSDALE		Mean invertebrate catch per trap per day												
28/08/95 - 01/09/95 (4 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11	12
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0.25	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0.75	0	0.25	0.50	0	0	0
	Acari	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	familyV	0	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0.25	0	0	0	0	0	3.50	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0.50	0	0	0.25	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	0	0.25	1.50	2.25	0	0.50	0	0.75	0 25	0.25	0	0
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0.25	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0.25	0	0	0	0	0	0	0.50	0	0.25	0
		Drosophilidae	0	0	0	0	0	0	0	0	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	505.5	500.75	313.75	92.25	152.5	110	83.75	40.50	75.50	20.25	109.75	182.25
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0.25	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Staphylinidae	0	0	0	0	0	0	0	0	0.50	0	2.50	0
		Zyras humeralis	0	0.25	0	0	0	0.50	0.25	0	0.25	0	0.25	0.25
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0.50	0	0	0	0	0	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

DIMSDALE		Mean Invertebrate catch per trap per day											
28/08/95 - 01/09/95 (4 days)		Pitfall trap Number	13	14	15	16	17	18	19	20	21	22	23	24
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0.50	0	0	0	0.25
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0.25	0	0
	Acari	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	familyV	0	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0.25	0	0	0	0	0	0.25	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0	0.25
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	0.25	0	0	0	0	0.25	0	0.50	0	0	0	0
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0.25	0.25	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0.25	0	0	0	0	0	0	0	0	0	0	0
		Drosophilidae	0	0	0	0	0	0	0	0	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	407.5	391.25	188.5	325.25	350.25	156.25	22.50	23.00	281.5	303.75	386.5	440.5
		Myrmica ruginodis	0	0	0	0	0	0.25	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Staphylinidae	0	0	0	0	0	0	0	0	0	0.25	0	0
		Zyras humeralis	0	0	0	0.75	0	1.25	0.75	0.50	0	0	0.50	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0.25
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

DIMSDALE		Mean invertebrate catch per trap per day												
08/11/95 - 14/11/95 (6 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11	12
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0.333	0	0	0	0	0	0	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0.667	0.333	0.500	1.000	1.167	0.833	1.500	1.167	0.167	0
	Acari	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	familyV	0	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0	0.167	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	2.000	0	0.833	0.500	0	2.000	0.833
	Collembola	Entomobryidae	0	0	0	0	0	0	0.167	0.167	0.167	0	0.167	0
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0.167	0	0	0	0.167	0	0.167	0	0	0.167
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0.167	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0.167	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0.167	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0.167	0	0.500	0.333	0.167	0	0.333	0	0.333	0.167	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0.167	0.167	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0.167	0.833	0.333	0.167	0	0	0.667	0	0.167	0	0.167	0.333
		Drosophilidae	0.333	1.333	0.333	0.167	0.333	0.333	0	0	0	0	0	0.333
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphondae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0.167	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	263.83	17.00	6.333	2.500	1.167	1.333	0.500	0.833	1.000	1.000	0 667	2 000
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Staphylinidae	0.167	0.833	0.500	0.333	0	0.333	0.500	0.500	1.333	0.500	0.667	0.667
		Zyras humeralis	0	0	0	0	0	0	0.333	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0	0	0	0	0.167	0	0.167
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0.167	0.167	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0.167	0	0	0	0	0.333	0.167
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

DIMSDALE		Mean invertebrate catch per trap per day											
08/11/95 - 14/11/95 (6 days)		Pitfall trap Number	13	14	15	16	17	18	19	20	21	22	23	24
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0.167	0	0	0	0	0	0	0	0	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0.167	0.667	2.167	0.500	0.500	0	0.167	0.167	0.667	0.167	0.333	0.500
	Acari	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	familyV	0	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0.167	0	0.167	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0.667	0.167	1.000	1.000	0	1.167	0	0	0	0.833	0
	Collembola	Entomobryidae	0	0.167	0.167	0	0	0	0	0.333	1.000	0	0	0.167
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0.167	0	0.167	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0.167	0.333	0.333	0	0.333	0	0.167	0.667	0	0.500	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0.167	0.667	0.167	0.167	0	0.167	0.333	0	0.333	0	0
		Drosophilidae	0.167	0.167	0.167	0	0	0	0	0.167	0.167	0	0.333	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	0.500	3.000	2.000	3.333	4.167	6.667	1.167	1.833	2.333	20	7.000	11.50
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Staphylinidae	1.000	2.500	0.167	0.667	0.500	0	0	0	0.333	0.167	0.333	0.167
		Zyras humeralis	0	0.167	0	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0.167	0	0	0	0.167	0.167	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

DIMSDALE		Mean invertebrate catch per trap per day												
11/02/96 to 21/02/96 (10 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11	12
ARACHNIDA	Araneae	Clubionidae		0	0	0	0	0	0	0	0	0	0	0
		Lycosidae		0	0	0	0	0	0	0	0	0	0	0
		family?		0	0	0.1	0	0	0	0	0	0.3	0	0
	Opiliones	Nemastomatidae		0	0	0	0	0	0	0	0	0	0	0
		family?		0	0	0	0	0	0	0	0.1	0	0	0
	Acari	family?		0	0	0	0.1	0	0	0.1	0	0.1	0	0
	Pseudoscorpionida	familyV		0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae		0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae		0	0	0	0	0	0	0	0.1	0.2	0	0
		Oniscidae		0	0	0	0	0	0	0	0	0	0	0
		Philosciidae		0	0	0	0	0	0	0	0	0	0	0
		family?		0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae		0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae		0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae		0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae		0	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae		0	0	0	0	0	0	0	0	0.1	0	0
	unknown	family?		0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae		0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?		0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae		0	0.1	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae		0.5	0.1	0.3	0	0.3	0.1	0	0	0	0	0
		Sminthuridae		0	0	0.1	0	0	0	0.1	0.5	0	0	0.1
	Dermaptera	Forficulidae		0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae		0	0	0	0	0	0	0	0	0	0	0
		Reduviidae		0	0	0	0	0	0	0	0	0	0	0
		family?		0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?		0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae		0	0	0	0	0	0	0	0	0	0	0
		leafhoppers		0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)		0	0	0	0	0	0	0	0	0	0	0
		family? (larva)		0.1	0	0	0.1	0	0	0	0	0	0	0
	Diptera	Trichoceridae		0	0.1	0	0.3	0.1	0.2	0	0	0	0.1	0
		Anisopodidae		0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)		0	0	0	0	0	0.1	0	0	0	0	0
		Empididae		0	0	0	0	0	0	0	0	0	0	0
		Phoridae		0	0	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)		0	0	0	0	0	0	0	0	0	0	0
		Drosophilidae		0	0.2	0	0	0.1	0	0.1	0	0	0.2	0
		Dolichopodidae		0	0	0	0	0	0	0	0	0	0	0
		Syrphidae		0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae		0	0	0	0	0	0	0	0	0	0	0
		Asilidae		0	0	0	0	0	0	0	0	0	0	0
		family?		0	0	0.1	0	0	0	0	0	0	0	0
		family? (larva)		0	0	0	0	0	0.1	0	0	0	0	0
	Hymenoptera	Cynipoidea		0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea		0	0	0	0	0	0	0	0	0	0	0
		Vespidae		0	0	0	0	0	0	0	0	0	0	0
		family?		0	0	0	0	0	0	0	0	0	0	0
		Formica rufa		0	0	0	0	0	0	0	0	0	0	0
		Myrmica ruginodis		0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae		0	0	0	0	0	0	0	0	0	0	0
		Staphylinidae		0.1	0.2	0.5	0.6	0.1	0.3	0.2	1.2	0.2	0.2	0.5
		Zyras humeralis		0	0	0	0	0	0	0	0	0	0	0
		Elateridae		0	0	0	0	0	0	0	0	0	0	0
		Curculionidae		0	0.2	0	0	0	0	0	0	0	0	0.1
		Lucanidae		0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae		0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae		0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae		0	0	0	0	0	0	0	0	0	0	0
		family?		0	0	0	0	0	0	0.1	0	0.1	0	0
		family? (larva)		0.1	0	0.1	0	0	0	0.1	0	0.2	0.2	0.1
		nymph?		0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?		0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae		0	0	0	0	0	0	0	0	0	0	0
		Helicidae		0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae		0	0	0	0	0	0	0	0	0	0	0

DIMSDALE		Mean invertebrate catch per trap per day											
11/02/96 to 21/02/96 (10 days)		Pitfall trap Number	13	14	15	16	17	18	19	20	21	22	23	24
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0			0	0
		Lycosidae	0	0	0	0	0	0	0	0			0	0
		family?	0	0	0.2	0	0	0	0	0			0.1	0.2
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0			0	0
		family?	0	0	0	0.1	0	0	0	0			0	0
	Acari	family?	0	0.1	0.1	0	0	0	0	0			0	0
	Pseudoscorpionida	familyV	0	0	0	0	0	0	0	0			0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0			0	0
		Porcellionidae	0	0.1	0.8	0	0	0	0	0			0	0
		Oniscidae	0	0	0	0	0	0	0	0			0	0
		Philosciidae	0	0	0	0	0	0	0	0			0	0
		family?	0	0	0	0	0	0	0	0			0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0			0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0			0	0
		Chordeumatidae	0	0	0	0	0	0	0	0			0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0			0	0.1
	Julida	Julidae	0	0	0	0	0	0	0	0			0	0
	unknown	family?	0	0	0	0	0	0	0	0			0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0			0	0
	Geophilomorpha	family?	0	0	0	0.1	0	0	0	0			0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0			0	0
	Collembola	Entomobryidae	0	0	0	0.2	0.1	0.1	0.1	0			0.2	0.1
		Sminthuridae	0	0	0	0	0	0	0	0			0.1	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0			0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0.1			0	0
		Reduviidae	0	0	0	0	0	0	0	0			0	0
		family?	0	0	0	0	0	0	0	0			0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0			0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0			0	0
		leafhoppers	0	0	0	0	0	0	0	0			0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0			0	0
		family? (larva)	0	0	0	0	0	0	0	0			0	0
	Diptera	Trichoceridae	0	0.1	0.1	0	0.1	0.2	0.7	0			0.1	0
		Anisopodidae	0	0	0	0	0	0	0.1	0			0	0
		Mycetophilidae (+Sciaridae)	0	0.1	0	0	0	0	0.2	0			0	0
		Empididae	0	0	0	0	0	0	0	0			0	0
		Phoridae	0	0	0	0	0	0	0	0			0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0	0	0	0	0			0	0.1
		Drosophilidae	0	0	0.1	0	0	0	0	0.1			0	0.1
		Dolichopodidae	0	0	0	0	0	0	0	0			0	0
		Syrphidae	0	0	0	0	0	0	0	0			0	0
		Calliphoridae	0	0	0	0	0	0	0	0			0	0
		Asilidae	0	0	0	0	0	0	0	0			0	0
		family?	0	0	0	0	0	0	0	0			0	0
		family? (larva)	0	0	0	0	0	0	0	0			0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0			0	0
		Chalcidoidea	0	0	0	0	0	0	0	0			0	0
		Vespidae	0	0	0	0	0	0	0	0			0	0
		family?	0	0	0	0	0	0	0	0			0	0
		Formica rufa	0	0	0	0	0	0	0	0			0	0.3
		Myrmica ruginodis	0	0	0	0	0	0	0	0			0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0			0	0
		Staphylinidae	0.5	0.5	0.6	0.2	0.2	0.3	0.1	0.2			0.1	0.5
		Zyras humeralis	0	0	0	0	0	0	0	0			0	0
		Elateridae	0	0	0	0	0	0	0	0			0	0
		Curculionidae	0	0.1	0	0	0	0	0	0			0	0
		Lucanidae	0	0	0	0	0	0	0	0			0	0
		Coccinellidae	0	0	0	0	0	0	0	0			0	0
		Tenebrionidae	0	0	0	0	0	0	0	0			0	0
		Chrysomelidae	0	0	0	0	0	0	0	0			0	0
		family?	0	0	0	0	0	0	0	0.1			0	0
		family? (larva)	0.1	0.1	0.1	0	0	0.1	0	0			0	0
		nymph?	0	0	0	0	0	0	0	0			0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0			0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0			0	0
		Helicidae	0	0	0	0	0	0	0	0			0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0			0	0

DIMSDALE		Mean invertebrate catch per trap per day												
02/04/96 - 08/04/96 (6 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11	12
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0.167	0.333	0	0.167	0.333	0	0	0.167	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Acari	family?	0	0	0	0	0	0	0	0.167	0.333	0	0	0
	Pseudoscorpionida	familyV	0	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0.167	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0 333	0.667	0	0.333	0 833	0	0	0
	Collembola	Entomobryidae	0	0	0	0	0	0	0	0.167	0	0	0	0.167
		Sminthuridae	0	0	0	0	0.167	0	0	0.167	0.500	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0.167	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0.167	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0.167	0	0	0.167
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0	0	0	0	0	0	0	0	0.167
		Drosophilidae	0	0	0	0	0	0	0	0	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	42.167	26.333	96.167	0.833	5.333	0.833	1.000	0.333	0.333	0.167	0.833	1.833
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0	0.333	0	0
		Staphylinidae	0	0	0	0.167	0.333	0.333	0.167	0.167	0.167	0	1.333	0.667
		Zyras humeralis	0	0	0	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0.167	0	0	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0.333	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

DIMSDALE		Mean invertebrate catch per trap per day											
02/04/96 - 08/04/96 (6 days)		Pitfall trap Number	13	14	15	16	17	18	19	20	21	22	23	24
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0.33	0.17	0	0.17	0	0.33	0.50	0.17	0	0.17	0.17	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Acari	family?	0	0.17	0	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	familyV	0	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0.17	0	0	0	0	0	0	0	0	0	0.17	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	0.17	0	0	0	0	0	0.17	0	0	0	0	0
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0.17	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0.17	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0.17	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0.17	0	0	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0.17	0	0	0	0	0	0	0	0	0	0
		Drosophilidae	0	0	0	0	0	0	0	0	0	0	0.17	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	0.33	5.00	25.17	97.17	8.00	354.5	5.67	95.17	132.67	277.17	99.17	538.17
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0.50	0.17	0	0	0	0	0	0	0	0
		Staphylinidae	0.67	0.17	0	0.17	0.17	0	0.17	0	0	0	0.17	0.33
		Zyras humeralis	0.17	0	0	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0.17	0	0	0	0	0	0	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0.17	0	0	0	0	0.17	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

DIMSDALE		Mean invertebrate catch per trap per day												
23/06/96 - 26/06/96 (3 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11	12
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0.3	0	0	0	0	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	1.3	1.0	1.0	5.7	0.7	10.7	5.7	3.3	4 0	0.7	12.0
	Acari	family?	0	0	0	0	0.3	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0.3	0	0.3	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0.3	1.0	0.3	0.3	0	0	0	0	0.7	0.3	0	0.7
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0.3	0	0	0	0	0	0	0	0	0 3	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0.7	0	1.7	0	1.0	1 0	1 3	0	0.3
	Collembola	Entomobryidae	9.0	0.3	1.0	2.3	3.0	2.0	0.7	0	0.7	0	1.0	1.0
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0.3	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0.3	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0.3	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0.3	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0.7	0	0	0.7	0	0	0.3	0	0	0
		Empididae	0	0	0	0	0	0	0	0.7	1.0	0	0.3	0
		Phoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0.7	0	2.3	0.3	0.3	0	0.7	0.3	0.3
		Drosophilidae	0.3	1.0	1.3	1.3	1.3	1.3	1.3	1.3	2.0	2.0	0.7	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0.3	0	0	0.3	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	376.0	172.0	262.3	111.0	111.7	157.3	64 3	51.7	141.7	139 7	55 0	57.0
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0.3	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Staphylinidae	0	0.3	0.3	0	0	0	0.7	0.7	0 3	0.3	0.3	0
		Zyras humeralis	0	0	0	1.3	0	0.3	0	0	0.7	0	0	0.3
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0.7	0	1.3	0	0.3	0.7	1.0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0.3	0	0	1.7	0.3	1.0	0.3
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

DIMSDALE		Mean invertebrate catch per trap per day											
23/06/96 - 26/06/96 (3 days)		Pitfall trap Number	13	14	15	16	17	18	19	20	21	22	23	24
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0.3	0	0	0	0	0
		family?	0	0.3	0	0	0	0	0	0.3	0	0	0.3	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	6.3	2.0	0.7	0.3	0	0.3	0.3	3.7	0	0	0	0
	Acari	family?	0.3	0.7	0.3	0.3	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0.3	0.7	0.3	0.3	0	0	0	0.3	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0.3	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0.3	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0.3	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	0	0.3	0.7	0.7	0	0	0	0.3	0	0	0.3	1.0
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0.3	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0.3	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0.3	0	0	0	0	0	0	0	0	0	0
		Empididae	0.7	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0.3	0.3	0	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	1.0	0.7	0	0	0	0	0	0	0	0	0
		Drosophilidae	0.3	1.3	1.7	0	0	0	0	0.3	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	165.3	295.3	227.7	265.0	284.7	412.3	119.3	185.7	225.3	343.7	384.0	394.3
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Staphylinidae	0	0.3	0	0	0.7	0	0	0	0.3	0	0	0
		Zyras humeralis	2.0	0	0	0	0	0	2.3	2.3	0	0	0.7	0.3
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0	0	0.3	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0.3	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

Appendix L: Mean invertebrate catch per pitfall trap per day for Halse for 1994 to 1996

HALSE			Mean invertebrate catch per trap per day								
23/11/94 - 30/11/94 (7 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0.286	0	0.143
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0.714	1.143	1.286	0.429	2.857	1.286	2.286
	Acari	family?	0	0	0	0	0	0.143	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0.143
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0.143	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0.143	0	0.143	0	0	0.143
	Collembola	Entomobryidae	0.286	0.714	1.143	0.286	0	0.429	1.143	1.429	1.857
		Sminthuridae	0.286	0	0.143	0.429	0	0.571	0.429	0.143	0.857
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0.286	0
		Reduviidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0.571	0.286	0.286
		Phoridae	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0	0	0	0	0	0
		Drosophilidae	0	0	0	0	0	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0
		family?	0.286	0.429	0.429	0.429	0.286	0.286	0.857	0.857	1.000
		family? (larva)	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		Formica rufa	2.286	0.571	61.714	0.429	0.286	0.143	0	0.571	0
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0.286
		Staphylinidae	0.286	0	0.286	0.571	1.571	0.143	2.429	1.429	1.143
		Zyras humeralis	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0.143	0	0	0	0	0.143
		Lucanidae	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0.286	0.143	0.143
		family?	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0.143	0.143	0.286	0.143	0	0.571
		nymph?	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0.143	0	0	0	0	0	0	0	0.143
		Helicidae	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0

HALSE			Mean invertebrate catch per trap per day								
23/11/94 - 30/11/94 (7 days)		Pitfall trap Number	10	11	12	13	14	15	16	17	18
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0
		family?	0.143	0	0	0	0	0	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0
		family?	0.286	0.714	1.429	4.571	3.143	3.429	1.429	0.143	0.429
	Acari	family?	0	0	0.143	0	0	0	0.571	0	0
	Pseudoscorpionida	family?	0	0.429	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0.143	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0.714	0	0.143	0.143	0	0	0	0.286	0
	Collembola	Entomobryidae	0.571	0.286	0.571	2.429	1.286	1.143	0.857	1.143	0.286
		Sminthuridae	0.429	0.429	0.429	0.429	0.714	0.571	0.571	0.714	0.429
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0.143	0	0.143	0.143	0	0.143	0.286	0.286
		Reduviidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0.143	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0
		Empididae	0	0.143	0	0	0	0.143	0	0.143	0
		Phoridae	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0	0	0	0	0	0
		Drosophilidae	0	0	0	0	0	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0
		family?	0.429	0.571	0.571	1.143	0.714	0.286	0.857	1.286	0.429
		family? (larva)	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		Formica rufa	0	0	0.286	1.286	0.714	2 714	1.000	3 000	11.429
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0.143
		Staphylinidae	1.571	0.571	1.286	0.429	0.857	0.857	0.571	1.714	0.429
		Zyras humeralis	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0.143	0	0.143	0	0.429	0
		Lucanidae	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		family? (larva)	0.143	0.429	0	0	0.286	0.143	0.143	0	0
		nymph?	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0.143	0	0	0	0	0	0.143	0
		Helicidae	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0

HALSE			Mean invertebrate catch per trap per day								
11/01/95 - 18/01/95 (7 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0.143	0	0.143
		Lycosidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0.143	0	0	0	0.143	1.143	0
	Acari	family?	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0.143	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	0	0	0.714	0	0.143	0	0	0	0.143
		Sminthuridae	0	0	0.143	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0.143	0
		Reduviidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0.286	0.143	0.286	0	0.143	0.143	1.143	3.000	0.286
		Anisopodidae	0	0.286	0	0	0.143	0	0.286	0.286	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0	0	0	0	0	0
		Drosophilidae	0	0	0	0	0.143	0.143	0.143	0	0.286
		Dolichopodidae	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		Formica rufa	0.143	0	0	0	0	0	0	0	0
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0
		Staphylinidae	0	0	0.143	0	0	0.143	1.000	0	0.286
		Zyras humeralis	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0	0	0	0.143
		Lucanidae	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0
		family?	0	0.143	0.143	0	0	0	0	0	0
		family? (larva)	0	0	0	0.143	0	0	0	0	0.143
		nymph?	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0.143	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0

HALSE			Mean invertebrate catch per trap per day								
11/01/95 - 18/01/95 (7 days)		Pitfall trap Number	10	11	12	13	14	15	16	17	18
ARACHNIDA	Araneae	Clubionidae	0	0.143	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0.429	0.571	0.143	0	0	0.286	0.143
	Acari	family?	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0.143
		Oniscidae	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	0	0	0.286	0	0	0	0	0	0
		Sminthuridae	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0.143
		Reduviidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0.571	0.714	0.714	1.571	3.571	0 429	0	0.571	2.429
		Anisopodidae	0.286	0.429	0	0.143	0	0	0	0.143	0.143
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0.143	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0	0	0	0	0	0.143
		Drosophilidae	0	0.429	0	0	0.143	0	0	0.286	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		Formica rufa	0	0	0	0	0	0	0	0.143	0
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0
		Staphylinidae	0	0.143	0	0	0.429	0.571	0	0.429	0.429
		Zyras humeralis	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0.143	0	0	0.286
		Lucanidae	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		family? (larva)	0.286	0	0.143	0.143	0	0.143	0	0.143	0
		nymph?	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0.143	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0

HALSE			Mean invertebrate catch per trap per day								
05/04/95 to 10/04/95 (5 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9
ARACHNIDA	Araneae	Clubionidae	0	0.2	0	0.2	0.6	0.4	0 6	0.2	
		Lycosidae	0	0	0	0	0	0	0	0	
		family?	0	0	0	0	0	0	0	0	
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	
		family?	0	0	0	0	0	0	0	0.2	
	Acari	family?	0	0	0	0	0.2	0	0.2	0	
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	
		Porcellionidae	0.4	0	1.0	0.2	0	0	0	0	
		Oniscidae	0	0	0	0	0	0	0	0	
		Philosciidae	0	0	0	0	0	0	0	0	
		family?	0	0	0	0	0	0	0	0	
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	
		Chordeumatidae	0	0	0	0	0	0	0	0	
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0.2	0	
	Julida	Julidae	0	0	0.2	0	0	0	0	0	
	unknown	family?	0	0	0	0	0	0	0	0	
CHILOPODA		Lithobiidae	0	0	0	0.2	0	0	0	0	
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	
	Collembola	Entomobryidae	0.6	0.6	1.8	0.4	0	0 6	0.4	0	
		Sminthuridae	0	0	0	0	0	0.2	0.2	0	
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	
		Reduviidae	0	0	0	0	0	0	0	0	
		family?	0	0	0	0	0	0	0	0	
	Thysanoptera	family?	0	0	0	0	0	0	0	0	
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	
		leafhoppers	0	0	0	0	0	0	0	0.2	
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	
		family? (larva)	0	0	0	0	0	0	0	0	
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	
		Anisopodidae	0	0	0	0	0	0	0	0	
		Mycetophilidae (+Sciaridae)	0	0	1.2	0	0	0	0	0.2	
		Empididae	0	0.2	0	0	0	0	0	0	
		Phoridae	0	0	0	0	0	0	0	0	
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0	0	0	0	0	
		Drosophilidae	0	0	0.2	0	0	0	0	0	
		Dolichopodidae	0	0	0	0	0	0	0	0	
		Syrphidae	0	0	0	0	0	0	0	0	
		Calliphoridae	0	0	0	0	0	0	0	0	
		Asilidae	0	0	0	0	0	0	0	0	
		family?	0	0	0	0	0	0	0	0	
		family? (larva)	0	0	0.2	0	0	0	0	0	
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	
		Chalcidoidea	0	0	0	0	0	0	0	0	
		Vespidae	0	0	0	0	0	0	0	0	
		family?	0	0	0	0	0	0	0	0	
		Formica rufa	187.0	86.8	276.6	71.4	44.4	46.0	57.4	0.4	
		Myrmica ruginodis	0	0	0	0	0	0	0	0	
	Coleoptera	Carabidae	0	0	0.2	0	0	0	0	0	
		Staphylinidae	0	0.6	0	0	0.4	0.4	0	0	
		Zyras humeralis	0.2	4.4	0	2.0	0.2	0.6	1.4	0	
		Elateridae	0	0	0	0	0	0	0	0	
		Curculionidae	0	0	0	0.2	0.2	0.2	0.2	0.4	
		Lucanidae	0	0	0	0	0	0	0	0	
		Coccinellidae	0	0	0	0	0	0	0	0	
		Tenebrionidae	0	0	0	0	0	0	0	0	
		Chrysomelidae	0	0	0	0	0	0	0	0	
		family?	0	0	0	0.4	0	0	0.2	0	
		family? (larva)	0	0	0	0	0	0	0	0	
		nymph?	0	0	0	0	0	0	0	0	
	Plecoptera	family?	0	0	0	0	0	0	0	0	
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	
		Helicidae	0	0	0	0	0	0	0	0	
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	

HALSE			Mean invertebrate catch per trap per day								
05/04/95 to 10/04/95 (5 days)		Pitfall trap Number	10	11	12	13	14	15	16	17	18
ARACHNIDA	Araneae	Clubionidae	0.2	0.6	0.2	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0.4	0.6	0.6	1.0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
	Acari	family?	0	0	0	0	0	0	0	0	0.2
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0.2	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0.2	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0.4	0	0	0	0	0	0.2	0.4	0
	Collembola	Entomobryidae	0.6	0	0.2	0.2	0.6	0	1.8	0.2	0.2
		Sminthuridae	0.2	0	0.2	0.2	1.2	0	5.0	0.4	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0.2	0	0	0	0	0.2
		Empididae	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0.2	0	0	0	0	0	0	0	0
		Drosophilidae	0	0	0	0	0	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		Formica rufa	34.8	36.2	118.2	30.2	8.2	96.8	40.4	217.8	314 8
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0
		Staphylinidae	0	0	0.2	0.2	0.4	0	0	0.2	0.2
		Zyras humeralis	1.0	1.0	0	0	0	0.2	0	0.4	0
		Elateridae	0	0	0	0	0	0	0	0	0
		Curculionidae	0.4	0.2	0	0.2	0.8	0	0.6	0.4	0
		Lucanidae	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0
		family?	0	0.2	0	0	0	0.2	0.2	0 2	0.2
		family? (larva)	0	0	0	0	0.4	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0

HALSE			Mean invertebrate catch per trap per day								
15/05/95 to 19/05/95 (4 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0
		family?	0.50	0.50	0	0	0	0	0	0.75	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0
		family?	0.50	0 25	0.50	0	0	0	0	2.25	1.25
	Acari	family?	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0
		Porcellionidae	0.25	0	2.75	0.75	0	0	0.25	0.25	0.25
		Oniscidae	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0.50	0.50	0	0	0	0	0.25	0
	Julida	Julidae	0	0	1.25	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	0.75	0.25	0.75	0.25	0	0	4 50	0	0.50
		Sminthuridae	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0
		Reduvlidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0.50	0	0	0 25	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0.25	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0.25	0	0.25	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0	0	0	0	0	0
		Drosophilidae	0	0	0	0.25	0.25	0	0	0	0.25
		Dolichopodidae	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		Formica rufa	171.75	11.25	198.50	50	15.75	5.25	2.00	1.25	6.25
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0
		Staphylinidae	0	0	0.25	0.75	0	0.50	0	0	0.25
		Zyras humeralis	0	0.75	0	0	0.50	0	0.75	0.25	0.25
		Elateridae	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0.50	0 50	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0.25	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0

HALSE			Mean invertebrate catch per trap per day								
15/05/95 to 19/05/95 (4 days)		Pitfall trap Number	10	11	12	13	14	15	16	17	18
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0
		family?	0.25	0	0	0.25	0.25	0.25	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0
		family?	1.25	0	0	0.75	0.50	0.25	0.50	0.25	0
	Acari	family?	0	0	0	0	0	0.25	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0
		Porcellionidae	0.50	0	0	0 25	0 25	0	0.25	0.25	0
		Oniscidae	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0.25	0	0	0	0	0	0	0.50	0.25
	Julida	Julidae	0.25	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	0.75	0	0 25	0	1.25	0.25	0.25	0.50	0
		Sminthuridae	0	0	0	0	0.25	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0.75	0	0.25	0	0.25	0
		leafhoppers	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0.25	0	0	0	0	0.25	0	0	0.25
		Empididae	0.25	0	0	0	0	0	0	0.25	0
		Phoridae	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0	0	0	0.25	0	0
		Drosophilidae	0.25	0	0	0.25	0	0.25	0.25	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		Formica rufa	12.00	3.00	94.75	11.25	3.75	40.25	21.00	141.00	201.25
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0
		Staphylinidae	0.25	0	0.50	0	0	0	0	0	0
		Zyras humeralis	1.00	0.50	0	0	0	0.25	0	0.50	0.25
		Elateridae	0	0	0	0	0	0	0	0	0
		Curculionidae	1.25	0.25	0	0.25	0	0	0	0.25	0
		Lucanidae	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0
		family?	0.25	0	0.25	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0.50	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0.25	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0

HALSE			Mean invertebrate catch per trap per day								
10/07/95 to 14/07/95 (4 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0
		family?	0	0.25	0	0	0	0	0	0.50	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0
		family?	0	0.75	0.75	0	0.75	1.75	4.00	11.00	0.50
	Acari	family?	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	1.50	0.25	0	0	0	0.50	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0.25	0	0	0.50	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	0	2.00	0	0.25	1.50	0	1.75	0.50	0.25
		Sminthuridae	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0.25	0
		family?	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0.25	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0.25	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0.75	0.25
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0.25	0	0	0	0	0	0.25	0
		Drosophilidae	0	0	0	0	0.75	0.25	1.00	0.25	0
		Dolichopodidae	0	0	0	0	0.25	0	0.25	0.25	0
		Syrphidae	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		Formica rufa	260.25	127.25	347.25	209.50	185.25	151.25	116.75	52.25	103.75
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0
		Staphylinidae	0	0.50	0	0	0.25	0	0.50	0.25	0
		Zyras humeralis	0	2.25	0	0	4.25	1.00	0.25	0	0.50
		Elateridae	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0.25	0.25	0	0.25
		Lucanidae	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	1.00	0	0	0	0
		family? (larva)	0	0	0	0	0.50	0.50	0	0.25	0
		nymph?	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0

HALSE			Mean invertebrate catch per trap per day								
10/07/95 to 14/07/95 (4 days)		Pitfall trap Number	10	11	12	13	14	15	16	17	18
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0.25	0.50	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0
		family?	2.25	2.75	0.75	0.25	3.50	2.25	0.25	0.50	0
	Acari	family?	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0
		Porcellionidae	0.25	0	0.25	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0
		family?	0	0	4.25	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0.25	0	0.25	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0.25
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0.25	0	0	0	0	0	0.50	0	0
	Collembola	Entomobryidae	0.75	0.25	0	0	1.50	1.50	0.25	0.50	0
		Sminthuridae	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0.25	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0.25
		family?	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0.25	0.25	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0
		Phoridae	0.50	0.25	0.25	0	1.25	0	0.25	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0.25	0.25	0.25	0	0.50	0	0	0	0.25
		Drosophilidae	1.50	0	0.25	0	0	0	0	0	0
		Dolichopodidae	0	0	0	0	0.50	0 50	0.25	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		Formica rufa	123.00	99.00	122.25	134.25	140.50	176 50	196.25	386.50	385.50
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0
		Staphylinidae	1.00	0	0	0	0	0.25	0.25	0	0
		Zyras humeralis	0.50	2.75	0.75	0	0.25	0.75	0.50	0.50	0
		Elateridae	0	0	0	0	0	0	0	0	0
		Curculionidae	0.25	0	0.25	0.50	0.25	0.75	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		family? (larva)	0.25	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0

HALSE			Mean invertebrate catch per trap per day								
28/08/95 to 01/09/95 (4 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0		0
		Lycosidae	0	0	0	0	0	0	0		0
		family?	0	0	0	0	0	0	0		0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0		0
		family?	0	0.25	0	0.25	0.50	0.50	0.50		0.50
	Acari	family?	0	0	0	0	0	0	0		0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0		0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0		0
		Porcellionidae	0	0.25	0	0	0	0	0		0
		Oniscidae	0	0	0	0	0	0	0		0
		Philosciidae	0	0	0	0	0	0	0		0
		family?	0	0	0	0	0	0	0		0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0		0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0		0
		Chordeumatidae	0	0	0	0	0	0	0		0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0		0
	Julida	Julidae	0	0	0	0	0	0	0		0
	unknown	family?	0	0	0	0	0	0	0		0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0		0
	Geophilomorpha	family?	0	0	0	0	0	0	0		0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0		0
	Collembola	Entomobryidae	0	0	0.25	0	0	0.25	0.75		0
		Sminthuridae	0	0	0	0	0	0	0		0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0		0
	Hemiptera	Nabidae	0	0	0	0	0	0	0		0
		Reduviidae	0	0	0	0	0	0	0		0
		family?	0	0	0	0	0	0	0		0
	Thysanoptera	family?	0	0	0	0	0	0	0		0
	Homoptera	Aphididae	0	0	0	0	0	0	0		0
		leafhoppers	0	0	0	0	0	0	0		0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0		0
		family? (larva)	0	0	0	0	0	0	0		0
	Diptera	Trichoceridae	0	0	0	0	0	0	0		0
		Anisopodidae	0	0	0	0	0	0	0		0
		Mycetophilidae (+Sciaridae)	0	0.25	0	0	0	0	0		0
		Empididae	0	0	0	0	0	0	0		0
		Phoridae	0	0	0	0	0	0	0		0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0	0.25	0	0		0.25
		Drosophilidae	0	0	0	0	0	0	0		0
		Dolichopodidae	0	0	0	0	0	0	0		0
		Syrphidae	0	0	0	0	0	0	0		0
		Calliphoridae	0	0	0	0	0	0	0		0
		Asilidae	0	0	0	0	0	0	0		0
		family?	0	0	0	0	0	0	0		0
		family? (larva)	0	0	0	0	0	0	0		0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0		0
		Chalcidoidea	0	0	0	0	0	0	0		0
		Vespidae	0	0	0	0	0	0	0		0
		family?	0	0	0	0	0	0	0		0
		Formica rufa	398.00	154.75	324.50	154.00	141.50	90	30.25		7.75
		Myrmica ruginodis	0	0	0	0	0	0	0		0
	Coleoptera	Carabidae	0	0	0	0	0	0	0		0
		Staphylinidae	0	0	0	0	0	0	0		0
		Zyras humeralis	0.75	4.50	0	2.75	2.50	1.25	0.50		0.25
		Elateridae	0	0	0	0	0	0	0		0
		Curculionidae	0	0	0	0	0	0	0		0
		Lucanidae	0	0	0	0	0.25	0	0		0
		Coccinellidae	0	0	0	0	0	0	0		0
		Tenebrionidae	0	0	0	0	0	0	0		0
		Chrysomelidae	0	0	0	0	0	0	0		0
		family?	0	0	0	0	0	0	0		0
		family? (larva)	0	0	0	0	0	0	0		0
		nymph?	0.25	0	0	0	0	0	0		0
	Plecoptera	family?	0	0	0	0	0	0	0		0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0		0
		Helicidae	0	0	0	0	0	0	0		0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0		0

HALSE			Mean invertebrate catch per trap per day								
28/08/95 to 01/09/95 (4 days)		Pitfall trap Number	10	11	12	13	14	15	16	17	18
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0
		family?	1.00	0	0	0.25	0	0.50	0.25	0	0
	Acari	family?	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0.25	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	0	0	0	0.50	0	0.25	0.50	0	0.25
		Sminthuridae	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0.25	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0.25	0	0	0	0	0
		Drosophilidae	0	0	0	0	0	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		Formica rufa	10	16.25	30.50	40.25	16.00	175.50	131.50	246.00	258.25
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0
		Staphylinidae	0	0.25	0	0	0.75	0	0	0	0
		Zyras humeralis	2.25	0	1.50	0.50	0	0.25	0.25	0	0
		Elateridae	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0.25	0
		family? (larva)	0	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0

HALSE			Mean invertebrate catch per trap per day								
08/11/95 to 14/11/95 (6 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0.33	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0
		family?	0.33	0.33	0.50	1.00	1.00	1.50	2.33	4.50	0.33
	Acari	family?	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0.17	0.17	0	0	0	0	0.17
		Oniscidae	0	0	0	0.17	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0.17	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0.67	0	0	0.33	2.50	1.33	0	0.17	0.83
	Collembola	Entomobryidae	0	0.33	0.33	0	0	0.17	0	0.17	0
		Sminthuridae	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0.17	0	0.33
		Reduviidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0.67	0.33	0.33	0	0.50	0.50	0.17
		Anisopodidae	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0.33	0
		Empididae	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0.17	0	0	0.50	0.17	0.67	0.17	0.17
		Drosophilidae	0	0	0	0.17	0	0	0.33	0.17	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0.17	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		Formica rufa	57.50	3.67	144.33	0.33	0.17	0.33	0.83	0.83	0.33
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0
		Staphylinidae	0	0	0	0 67	0	0.50	1.50	1.00	0.50
		Zyras humeralis	0.17	0	0	0	0	0	0	0.17	0
		Elateridae	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0.17	0	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0.50	0	0.17
		family? (larva)	0	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0.17	0	0	0.17	0	0	0.17	0	0
		Helicidae	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0

HALSE			Mean invertebrate catch per trap per day								
08/11/95 to 14/11/95 (6 days)		Pitfall trap Number	10	11	12	13	14	15	16	17	18
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0
		family?	0.17	0	0	0.17	0.17	0	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0
		family?	0.83	0.67	2.00	1.17	1.67	0.83	0.17	0.67	0.17
	Acari	family?	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0
		Porcellionidae	0.17	0	0	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0.17	0	0	0	0	0	0	0	0
	Julida	Julidae	0.17	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	2.00	0	0.17	0.83	2.17	1.00	0.83	0	0.33
	Collembola	Entomobryidae	0	0	0	0	0.33	0	0	0	0
		Sminthuridae	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0.17	0.17	0.17	0	0.17	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0.17	0
	Diptera	Trichoceridae	0.17	0.33	0.67	0	1.00	0	0	0.17	0
		Anisopodidae	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0.17	0	0.17	0.17	0	0.17	0	0.17	0
		Drosophilidae	0.17	0	0	0	0.17	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		Formica rufa	0.33	0.33	0.83	0.33	0.83	0.67	1 67	5.17	3.50
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0
		Staphylinidae	2.67	0.50	1.67	0.50	0.33	0 67	0	0.33	0
		Zyras humeralis	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0	0	0.17	0
		Lucanidae	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0
		family?	0	0.50	0.17	0	0.33	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0

HALSE			Mean invertebrate catch per trap per day								
11/02/96 to 21/02/96 (10 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9
ARACHNIDA	Araneae	Clubionidae					0	0	0	0	0
		Lycosidae					0	0	0	0	0
		family?					0	0	0	0	0.10
	Opiliones	Nemastomatidae					0	0	0	0	0
		family?					0	0.10	0	0	0
	Acari	family?					0	0	0	0	0
	Pseudoscorpionida	family?					0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae					0	0	0	0	0
		Porcellionidae					0	0	0.20	0	0
		Oniscidae					0	0	0	0	0
		Philosciidae					0	0	0	0	0
		family?					0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae					0	0	0	0	0
	Chordeumatida	Craspedosomatidae					0	0	0	0	0
		Chordeumatidae					0	0	0	0	0
	Polydesmida	Polydesmidae					0	0	0	0	0
	Julida	Julidae					0	0	0	0	0
	unknown	family?					0	0	0	0	0
CHILOPODA		Lithobiidae					0	0	0	0	0
	Geophilomorpha	family?					0	0	0	0	0
INSECTA	Diplura	Campodeidae					0	0	0	0	0
	Collembola	Entomobryidae					0	0	0	0	0
		Sminthuridae					0	0	0	0	0
	Dermaptera	Forficulidae					0	0	0	0	0
	Hemiptera	Nabidae					0	0	0	0	0
		Reduviidae					0	0	0	0	0
		family?					0	0	0	0	0
	Thysanoptera	family?					0	0	0	0	0
	Homoptera	Aphididae					0	0	0	0	0
		leafhoppers					0	0	0	0	0
	Lepidoptera	family? (micromoth)					0	0	0	0	0
		family? (larva)					0	0	0	0	0
	Diptera	Trichoceridae					0	0.10	0.10	0	0.10
		Anisopodidae					0	0	0	0	0
		Mycetophilidae (+Sciaridae)					0	0	0	0	0
		Empididae					0	0	0	0	0
		Phoridae					0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)					0	0	0	0	0
		Drosophilidae					0	0	0	0	0.10
		Dolichopodidae					0	0	0	0	0
		Syrphidae					0	0	0	0	0
		Calliphoridae					0	0	0	0	0
		Asilidae					0	0	0	0	0
		family?					0	0	0	0	0
		family? (larva)					0	0	0	0	0
	Hymenoptera	Cynipoidea					0	0	0.10	0	0
		Chalcidoidea					0	0	0	0	0
		Vespidae					0	0	0	0	0
		family?					0	0	0	0	0
		Formica rufa					0	0	0	0	0
		Myrmica ruginodis					0	0	0	0	0
	Coleoptera	Carabidae					0	0	0	0	0
		Staphylinidae					0.10	0.10	0.10	0.10	0.30
		Zyras humeralis					0	0	0	0	0
		Elateridae					0	0	0	0	0
		Curculionidae					0	0	0	0.10	0
		Lucanidae					0	0	0	0	0
		Coccinellidae					0.10	0	0	0	0
		Tenebrionidae					0	0	0	0	0
		Chrysomelidae					0	0	0	0	0
		family?					0	0	0	0	0
		family? (larva)					0	0	0	0	0
		nymph?					0	0	0	0	0
	Plecoptera	family?					0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae					0	0	0	0	0
		Helicidae					0	0	0	0	0
OLIGOCHAETA		Lumbricidae					0	0	0	0	0

HALSE			Mean invertebrate catch per trap per day								
11/02/96 to 21/02/96 (10 days)		Pitfall trap Number	10	11	12	13	14	15	16	17	18
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0.10	0	0	0.10	0	0.20
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
	Acari	family?	0	0	0	0	0.10	0	0	0	0.10
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0.40	0	0.10	0	0	0
		Oniscidae	0	0.20	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0.10	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0.10	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	0	0.20	0	0	0	0	0	0	0
		Sminthuridae	0	0	0	0	0	0	0.10	0	0.40
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0.10	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0.10	0	0	0.10	0.10	0.10	0	0	0.30
		Anisopodidae	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0.10
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0	0	0	0.10	0	0
		Drosophilidae	0	0	0	0	0.10	0	0.10	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0.20	0.10	0.10	0.10	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		Formica rufa	0	0	0	0	0	0	0	0.10	0.10
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0
		Staphylinidae	0.20	0.10	0	0	0.30	0	0.40	0.50	0.40
		Zyras humeralis	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0
		Curculionidae	0.10	0	0	0	0	0	0.10	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0

HALSE			Mean invertebrate catch per trap per day								
02/04/96 to 08/04/96 (5 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0
		family?	0	0.40	0	0.20	0.40	1.60	0.40	0.40	0.20
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
	Acari	family?	0	0	0	0	0	0.20	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0.20	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0.40	0.60	0	0.20	0	0
	Collembola	Entomobryidae	0	0	0	0	0	0	0.20	0.20	0
		Sminthuridae	0	0	0	0	0.20	0	0.40	2.20	0.20
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0.20	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0.40
		Anisopodidae	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0.20	0	0.20	0	0	0.20
		Empididae	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0.20	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0	0	0	0	0	0
		Drosophilidae	0	0	0	0	0	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		Formica rufa	32.60	162.60	33.00	5.40	1.00	0 60	0.40	0	0
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0
		Staphylinidae	0	0	0	0.20	0	0.80	0.80	0.80	0.20
		Zyras humeralis	0	0.20	0	0.20	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0.60	0.20	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0
		family?	0	0.20	0	0	0	0.20	0	0.60	0
		family? (larva)	0	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0

HALSE			Mean invertebrate catch per trap per day								
02/04/96 to 08/04/96 (5 days)		Pitfall trap Number	10	11	12	13	14	15	16	17	18
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0
		family?	1.00	0	0.40	0.80	1.40	1.00	0.40	1.00	0.20
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
	Acari	family?	0	0	0.20	0	0	0	0.20	0	0.20
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0.20	0	0.20	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0.20	0	0	0	0	0.20
	Collembola	Entomobryidae	0	0	0	0	0.20	0.60	0	0.40	0
		Sminthuridae	0	0	0	0.40	0.80	0	3.80	1.00	0.80
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0.20	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0
		Phoridae	0.20	0	0	0.20	0	0.20	0.20	0	0.40
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0	0	0	0	0.20	0.80
		Drosophilidae	0	0	0	0	0	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		Formica rufa	0	0	0	0	0	0.20	0	0	0.80
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0.20	0	0	0	0
		Staphylinidae	0.60	0.40	0.20	1.00	0.20	0.80	1.40	0	0
		Zyras humeralis	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0	0.20	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0.20	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0

HALSE			Mean invertebrate catch per trap per day								
23/06/96 to 26/06/96 (3 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0.67	2.00	2.00	0.67	0
	Acari	family?	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0.67	0	0	0	0	0	0	0.33
		Oniscidae	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0.33	0
	Collembola	Entomobryidae	0	0	0	0	0	0	0	0.33	0
		Sminthuridae	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0.33	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0.33	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0	0.33	0.33	0	0	0.33
		Drosophilidae	0	0	0	0	0	0	0.33	0	0
		Dolichopodidae	0	0	0	0	0	0	0.33	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		Formica rufa	215.33	278.00	207.33	138.33	189.00	131.33	179.33	30.33	144.33
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0
		Staphylinidae	0	0	0	0.33	0	0	0.33	0	0
		Zyras humeralis	0	0	0	0	2.33	0.33	0	0	0.67
		Elateridae	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0.33	0	0	0
		Lucanidae	0	0	0.33	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0

HALSE			Mean invertebrate catch per trap per day								
23/06/96 to 26/06/96 (3 days)		Pitfall trap Number	10	11	12	13	14	15	16	17	18
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0.67	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0
		family?	0	0.33	0	0	0	0	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0
		family?	2.00	0	0.67	0.33	0.33	0.33	0.67	0	0
	Acari	family?	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0
		Porcellionidae	0.33	0	0	0	0	0.33	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0.33	0	0	0.67	0	0	0	0
	Collembola	Entomobryidae	0.33	0	0	0.33	0.33	0	0	0	0
		Sminthuridae	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0
		Phoridae	0	0.67	0	0	0.33	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0.33	0	0	0	0	0	0	0	0
		Drosophilidae	0	0	0.33	0	0.33	0	0	0.33	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		Formica rufa	92.00	168.67	103.67	64.00	158.33	147.00	116.33	102.33	141.33
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0
		Staphylinidae	0	0	0.33	0.33	0	0	0	0	0.33
		Zyras humeralis	4.00	1.00	0	0	0.67	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0
		family? (larva)	0.33	0.33	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0

Appendix M: Mean invertebrate catch per pitfall trap per day for Control ants for 1994 to 1996

CONTROL ANTS			Mean invertebrate catch per trap per day											
23/11/94 - 30/11/94 (7 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11	12
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0.143	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0.429	0.714	0.286	0.714	0	0.286	0.286	0.286	0.143	0.143	0	0.571
	Acari	family?	0.143	0.143	0	0.429	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0.143	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0.143	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0.286	0	0	0	0.143	0	0.429	0	0	0
	Collembola	Entomobryidae	0.143	0	0.429	0	0.286	0	0	0.143	0.143	0	0.429	1.286
		Sminthuridae	0.143	0.143	0.143	0.286	0.143	0.143	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0.143	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0	0	0	0	0	0	0	0	0
		Drosophilidae	0	0	0	0	0	0	0	0	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0.143	0.286	0.286	0.143	0.286	0.857	0.143	0.286	0.429	0.429	0.429	0.143
		family? (larva)	0.143	0	0	0	0	0	0	0	0.143	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	8.286	1.571	0.857	0.143	0.143	0.429	0	0	0.571	0.714	4.714	33.14
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0.143	0	0	0.143	0
		Staphylinidae	0	0.714	0.143	1	0.429	0.571	0.286	0.571	2.286	1.143	0.143	0.143
		Zyras humeralis	0	0	0	0	0	0	0	0	0	0	0	0.143
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0.143	0	0.143	0	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0.143	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0.143
		family?	0	0	0	0	0	0.143	0	0	0	0	0	0
		family? (larva)	0.143	0.143	0	0	0	0	0.143	0.143	0	0.286	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0.143	0.286	0.286	0.857	0.143	0.429	0.143	0.143	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

CONTROL ANTS			Mean invertebrate catch per trap per day											
11/01/95 - 18/01/95 (7 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11	12
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0.143	0.143	0	0	0	0	0	0.143
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Acari	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0.143	0	0	0
	Collembola	Entomobryidae	0.143	0	0	0.143	0	0	0	0	0	0	0	0
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0.571	2.857	1.571	1.143	0.857	1.143	0	0	0.714	0.286	0.143	0.143
		Anisopodidae	0.429	0.286	0.429	0.286	0.429	0.143	0.286	0	0.143	0	0.286	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae+Sphaeroceridae)	0	0	0	0	0	0	0	0	0	0	0	0
		Drosophilidae	0	0.143	0	0	0.143	0	0	0	0	0	0.286	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	0	0	0	0	0	0	0	0.143	0	0	0	0.571
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Staphylinidae	0.143	0	0.143	0	0	0	0.286	0	0	0.143	0.143	0.429
		Zyras humeralis	0	0	0	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0.143	0.143	0.143	0	0.429	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

CONTROL ANTS			Mean invertebrate catch per trap per day											
05/04/95 - 10/04/95 (5 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11	12
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0	0.4
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0.2	0	0.2	0	0	0.2	0.2	0.4	0	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0.2	0	0	0	0.4	0	0	0	0
	Acari	family?	0	0.2	0	0.2	0	0	0	0	0.2	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0.2	0.2	0.2	0.2	0.2	0	0	0	0.2
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0.2	0.2
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0.2	0	0.2	0	0	1.6	0.2	0.2	0	0	0.2	0
	Collembola	Entomobryidae	0.2	0.4	0	0.2	0.6	0.4	0 2	0	0.4	0 4	0.2	2.2
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0	0.2
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0.2	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0.2	0	0	0	0
		Muscidae(+Fanniidae+Sphaeroceridae)	0	0	0	0	0	0	0	0	0	0	0	0
		Drosophilidae	0	0	0	0	0	0	0	0	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	99.8	1.6	1	5 6	0.8	24.6	46.6	4	100.8	26.8	98.6	56.4
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0.2	0	0	0	0
		Staphylinidae	0.2	0	0	0	0.6	0	0.2	0.8	0.4	0.6	0	0.2
		Zyras humeralis	0.2	0	0.2	0	0	0	0	0.4	0.2	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0.2	0.6	0	0	0.2	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0.2	0	0	0	0	0.2	0	0	0	0.4
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0.2	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

CONTROL ANTS			Mean invertebrate catch per trap per day											
15/05/95 - 19/05/95 (4 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11	12
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0		0	0	0	0
		Lycosidae	0	0	0	0	0	0	0		0	0	0	0
		family?	0	0	0	0	0	0	0		0	0	0.25	0.5
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0		0	0	0	0
		family?	0	0	0	0	1	0.75	1.5		0	0	0.25	0
	Acari	family?	0	0	0	0.75	0	0	0		0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0		0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0		0	0	0.25	0
		Porcellionidae	0	0	0	0	0	0	0		0	0	0	0
		Oniscidae	0	0	0	0	0	0	0		0	0	0	0.25
		Philosciidae	0	0	0	0	0	0	0		0	0	0	0
		family?	0	0	0	0	0	0	0		0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0.25	0		0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0		0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0		0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0.25	0	0.25		0.25	0	1.5	0.75
	Julida	Julidae	0	0	0	0	0	0	0		0	0	0	0
	unknown	family?	0	0	0	0	0	0	0		0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0		0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0		0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0		0	0.25	0.25	0
	Collembola	Entomobryidae	0	0.25	0.25	0	0	0.25	0.25		0	0.25	1.25	1.25
		Sminthuridae	0	0	0	0	0	0	0		0	0	0	0
	Dermaptera	Forficulidae	0.25	0	0	0	0	0	0		0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0		0	0	0	0
		Reduviidae	0	0	0	0	0	0	0		0	0	0	0
		family?	0	0	0	0	0	0	0		0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0		0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0		0	0	0.25	0
		leafhoppers	0	0	0	0	0	0	0		0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0		0	0	0	0
		family? (larva)	0	0	0	0	0	0	0		0	0.25	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0		0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0		0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0.25	0	0	0	0	0.25		0	0	0	0
		Empididae	0	0	0	0	0	0	0		0.25	0	0	0.25
		Phoridae	0	0	0	0	0	0	0		0	0	0	0
		Muscidae(+Fanniidae+Sphaeroceridae)	0	0	0	0.25	0.25	0	0.25		0	0.5	0.25	0
		Drosophilidae	0	0	0	0	0	0	0		0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0		0	0	0	0
		Syrphidae	0	0	0	0	0	0	0		0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0		0	0	0	0
		Asilidae	0	0	0	0	0	0	0		0	0	0	0
		family?	0	0	0	0	0	0	0		0	0	0	0
		family? (larva)	0	0	0	0	0	0	0		0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0		0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0		0	0	0	0
		Vespidae	0	0	0	0	0	0	0		0	0	0	0
		family?	0	0	0	0	0	0	0		0	0	0	0
		Formica rufa	328	8.75	14.25	3	4.5	41.25	30.25		50	42.5	41.5	84.25
		Myrmica ruginodis	0	0	0	0	0	0	0		0	0.25	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0		0	0	0	0
		Staphylinidae	0	0	0.25	1	1.75	0	0.25		0	0	0	0
		Zyras humeralis	0	0	0	0.5	0.75	1.5	0.75		0	0	0.25	0.75
		Elateridae	0	0	0	0	0	0	0.25		0	0	0	0
		Curculionidae	0	0	0	0.25	0	0	0		0.25	0.25	0	0.25
		Lucanidae	0	0	0	0	0	0	0		0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0		0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0		0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0		0	0	0	0
		family?	0	0	0	0	0	0	0.25		0	0	0.25	0
		family? (larva)	0	0	0	0	0	0	0		0	0	0	0
		nymph?	0	0	0	0	0	0	0		0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0		0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0.25	0	0		0.25	0	0	0
		Helicidae	0	0	0	0	0	0	0		0	0	0.25	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0		0	0	0	0

CONTROL ANTS			Mean invertebrate catch per trap per day											
10/07/95 - 14/07/95 (4 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11	12
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0.5	0.25	0	0	0	0	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0.75	2.25	1.5	2.75	0.75	3.75	0.25	0.25	0.25	0	0
	Acari	family?	0.25	0	0	0	0.25	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0.25	0	0.25	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0.25	0.25	0.25	0	0.25	0	0.25	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0.25	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	0.5	1.75	1	7	0	5	4.5	1.5	1	1.5	0	2.25
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0.25	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0.25	0.5	0.25	0.25	0.25	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	1.25	0.5	0.25	0.25	0	0	1	0	0
		Muscidae(+Fanniidae+Sphaeroceridae)	0	0.5	0.25	1.25	0.25	1.5	0.75	0	0.75	1.25	0	0
		Drosophilidae	0	0.75	0.5	3	3	0.75	1.5	0.25	0	0	0	0
		Dolichopodidae	0	0.25	0	0	0	0	0	0	0 25	0.25	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	377.8	153.3	101.3	78.25	82.5	159.3	86.25	62.25	138 3	132.3	173 8	203 8
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Staphylinidae	0.25	0.25	0.5	0	0	0.5	0	0 5	0.5	0 5	0	0
		Zyras humeralis	0	0.5	1	3.5	1.25	0.25	0	0	0	0	0	0.5
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0.25	0	0	0	0.5	0	0.25	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0.25	0.25	0.25	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0.5	0	0	0.25	0.25	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0.25	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

CONTROL ANTS			Mean invertebrate catch per trap per day											
28/08/95 - 01/09/95 (4 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11	12
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0.25	0	1	0 25	0	0	0	1.25	0.5	0	0	0.25
	Acari	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0.25	0	0	0	0	0	0.5	1	1.25	1
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0.25	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	0.5	0	0.75	0	0.25	0.75	1.25	1.25	0.25	0	0.25	0.25
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae+Sphaeroceridae)	0	0.25	0.5	0.25	0.25	0.25	0	0	0.5	0.25	0.25	0
		Drosophilidae	0.25	0	0.25	0	0	0	0	0	0	0.25	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	517.5	134.5	63.25	13.25	29.25	281.5	31.25	25.25	87.5	79	457.3	308.3
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Staphylinidae	0	0	0	0.25	0	0.5	0	0	0	0	0	0.25
		Zyras humeralis	0	0.25	0.5	1.25	0	1.75	0.75	0.25	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0	0	0.25	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0.25	0.25	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

CONTROL ANTS			Mean invertebrate catch per trap per day											
08/11/95 - 14/11/95 (6 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11	12
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0.667	0.833	0.667	1	0.833	1.167	0.5	3 5	0.833	2.5	0	0.5
	Acari	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0	0.167	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0.167	0.167	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0	0	0	0.167
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0.167	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0.5	0	0.167	1.167	0.167	0.333	0.333	0 667	0.167	7	0	0
	Collembola	Entomobryidae	0	0	0	0	0	0	0	0	0	0	0	0
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0.167	0.333	0	0	0	0
		Reduviidae	0.333	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0.5	0.333	0	0	0.333	0.833	0.167	0	0.333	0.667	0.167	0.167
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0.167	0	0	0	0	0	0	0	0.167
		Muscidae(+Fanniidae+Sphaeroceridae)	0.5	0.167	0.333	0.5	0	0.167	0	0	0.333	0.167	0	0.167
		Drosophilidae	0.333	0	0	0.333	0	0	0.167	0	0.167	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	25.83	2.5	0.5	0.167	0	24.17	0 667	1	2.333	0 667	9.833	4.167
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Staphylinidae	0.5	0	0.333	0.667	0.333	0.833	0.833	0 833	1.5	1	0	0.167
		Zyras humeralis	0	0	0	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0.333	0	0	0	0	0	0	0	0.167	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0.167	0.167	0	0.167	0.167
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0.333	0	0	0.167	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0.167	0	0	0	0	0.167	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

CONTROL ANTS			Mean invertebrate catch per trap per day											
11/02/96 - 21/02/96 (10 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11	12
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0		0	0	0
		Lycosidae	0	0	0	0	0	0	0	0		0	0	0
		family?	0	0.1	0	0	0	0	0.1	0		0.1	0	0.1
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0		0	0	0
		family?	0	0	0	0	0	0	0	0		0	0	0
	Acari	family?	0.1	0	0	0	0	0	0	0		0.1	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0		0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0		0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0		0	0	0
		Oniscidae	0	0	0	0	0	0	0	0		0	0	0
		Philosciidae	0	0	0	0	0	0	0	0		0	0	0
		family?	0	0	0	0	0	0	0	0		0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0		0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0		0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0		0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0		0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0		0	0	0
	unknown	family?	0	0	0	0	0	0	0	0		0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0		0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0		0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0		0.1	0	0
	Collembola	Entomobryidae	0.1	0.1	0	0	0	0	0	0		0.1	0.1	0.1
		Sminthuridae	0	0	0	0	0.1	0	0	0		0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0		0	0	0
	Hemiptera	Nabidae	0	0	0	0.1	0	0	0	0.2		0	0	0
		Reduviidae	0	0	0	0	0	0	0	0		0	0	0
		family?	0	0	0	0	0	0	0	0		0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0		0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0		0	0	0
		leafhoppers	0	0	0	0	0	0	0	0		0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0		0	0	0
		family? (larva)	0	0	0	0	0	0	0	0		0.1	0	0
	Diptera	Trichoceridae	0	0.1	0	0	0	0.1	0	0.1		0	0	0.6
		Anisopodidae	0	0	0	0	0.1	0	0	0		0	0	0.1
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0		0	0	0
		Empididae	0	0	0	0	0	0	0	0		0	0	0
		Phoridae	0	0	0	0	0	0	0	0		0	0	0
		Muscidae(+Fanniidae+Sphaeroceridae)	0	0	0	0	0	0	0	0		0	0	0
		Drosophilidae	0.1	0	0	0	0	0	0.1	0		0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0		0	0	0
		Syrphidae	0	0	0	0	0	0	0	0		0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0		0	0	0
		Asilidae	0	0	0	0	0	0	0	0		0	0	0
		family?	0	0	0	0	0	0	0	0		0	0	0
		family? (larva)	0	0	0	0	0	0	0	0		0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0		0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0		0	0	0
		Vespidae	0	0	0	0	0	0	0	0		0	0	0
		family?	0	0	0	0	0	0	0	0		0	0	0
		Formica rufa	0	0	0	0	0	0	0	0		0	0	0.4
		Myrmica ruginodis	0	0	0	0	0	0	0	0		0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0		0	0	0
		Staphylinidae	0.2	0.1	0.1	0.4	0.8	0.2	0.5	0.2		1.8	0	0.2
		Zyras humeralis	0	0	0	0	0	0	0	0		0	0	0
		Elateridae	0	0	0	0	0	0	0	0		0	0	0
		Curculionidae	0	0	0	0	0	0	0	0		0	0.1	0
		Lucanidae	0	0	0	0	0	0	0	0		0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0		0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0		0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0		0	0	0
		family?	0	0	0	0	0	0	0	0.1		0.1	0	0.4
		family? (larva)	0	0.1	0	0	0	0	0	0		0.2	0	0
		nymph?	0	0	0	0	0	0	0	0		0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0		0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0		0	0	0
		Helicidae	0	0	0	0	0	0	0	0		0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0		0	0	0

CONTROL ANTS			Mean invertebrate catch per trap per day											
02/04/96 - 08/04/96 (6 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11	12
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0.167	0	0.833	0.333	0.167	0.833	0.167	0.167	0.667	0	0.333
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Acari	family?	0	0.167	0	0	0	0.167	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0.167	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0	0	0.167	0.167
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0.167	0	0	0.167	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0	0.167	0.167	0
	Collembola	Entomobryidae	0	0	0	0	0	0	0	0	0	0.167	0	0.5
		Sminthuridae	0	0	0.167	0.167	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0.167	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0	0.167
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0.333	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0.167	0	0	0	0	0	0	0.5	0	0	0
		Muscidae(+Fanniidae+Sphaeroceridae)	0.167	0.167	0	0	0	0	0	0	0	0	0.167	0
		Drosophilidae	0	0	0	0.167	0	0	0	0	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0.167	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0.167	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	0.667	0.167	0	0.167	0.167	0.333	0.333	1.333	1.833	3.167	26.67	74.83
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0	0	0.167	0
		Staphylinidae	0.333	0.333	0.167	1.167	0.833	1	0.5	1.167	0	0.5	0.167	0
		Zyras humeralis	0	0	0	0	0	0	0	0	0	0	0	0.333
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0.167
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0.167	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0.167	0	0.167	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

CONTROL ANTS			Mean invertebrate catch per trap per day											
23/06/96 - 26/06/96 (3 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11	12
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0.667	0	0.667	0.333	0	1	0	0	0	0
	Acari	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0	0	0.333	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0.333	0	0	0	0	0
	Collembola	Entomobryidae	0	0	0	0	0	0	0	0	0	0	0	0
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0.333	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0.333	0	0.333	0	0	0	0	0
		Muscidae(+Fanniidae+Sphaeroceridae)	0	0.333	0.333	0.667	0	0.333	1	0	0.333	0	0	0
		Drosophilidae	0	0 667	0	0	1	0	0	0	0.333	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	355	117.7	133.7	96.33	64	139.3	184	165.3	107.7	151.3	147.7	188.3
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0	0	0	0
		Staphylinidae	0.333	0	0	0	0	0.333	0.333	0	0	0	0	0
		Zyras humeralis	0	0	0	0	1	0	0.333	2.667	0	0	0.333	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0.333	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0	0

Appendix N: Mean invertebrate catch per pitfall trap per day for Control no ants for 1994 to 1996

CONTROL NO ANTS			Mean invertebrate catch per trap per day										
23/11/94 - 30/11/94 (7 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0.143	0.286	0	0	0	0	0.143	0	0	0.143	0.143
	Acari	family?	0.286	0	0	0.286	0.143	0.571	0	0	0	0.286	0.429
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0	0	0
	Julida	*Julidae*	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0.143
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	0.429	0.286	0.143	0.143	0.143	0.429	0.714	1.143	0.571	1	1
		Sminthuridae	0	0	0	0	0	0	0	0.571	0.143	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0	0	0	0	0	0	0	0
		Drosophilidae	0	0	0	0	0	0	0	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0.286	0.286	0.143	0	0.286	0.143	0.143	0	0.143	0	0.286
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0.143	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	0	0	0	0	0	0	0	0	0	0	0
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0.143	0.143	0.429	0.143	0.143	0	1	0	0	0
		Staphylinidae	0.429	0.429	0	0.429	0	0	0.286	0.571	0.857	0	0.286
		Zyras humeralis	0	0	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0.286	0	0
		family? (larva)	0	0.571	0	0	0	0.286	0.286	0	0.429	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0.143	0	0.143	0	0.286	0.286	0.143	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0

CONTROL NO ANTS			Mean invertebrate catch per trap per day										
11/01/95 - 18/01/95 (7 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0.143	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
	Acari	family?	0	0	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0.143	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	0	0	0	0	0	0	0.429	0.143	0	0	0.143
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0.143
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0.143	0.143	0.143	0.143	0	0.143	0	0	0	0	0
		Anisopodidae	0.286	0	0	0.143	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0.143	0	0.143	0	0.143	0.143	0	0	0.143	0	0
		Drosophilidae	0	0	0	0	0	0	0.143	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	0	0	0	0	0	0	0	0	0	0	0
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0	0	0
		Staphylinidae	0.143	0	0	0	0	0.714	0.571	0	0	0	0.143
		Zyras humeralis	0	0	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0.286	0	0	0.143	0.143	0.143	0.286	0.429	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0.143	0	0	0	0	0.143	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0

CONTROL NO ANTS			Mean invertebrate catch per trap per day										
05/04/95 - 10/04/95 (5 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0.4	0	0	0	0.6	0	0 2	0.2	0.2
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0.2	0	0	0.2	0
	Acari	family?	0	0	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0.2	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0.2	0	0	0	0.2	0.2
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0.2	0	0
	Collembola	Entomobryidae	0	0	0.6	0.2	0.2	0.2	0.4	0	0.6	0	0.2
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0.4	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0	0	0	0.2	0	0	0	0
		Drosophilidae	0	0	0	0	0	0	0	0	0.2	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	0	0	0	0	0	0	0	0	0	0	0
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0.2	0	0	0	0	0	0.2	0
		Staphylinidae	0.2	0.2	0.6	0	1	0	0	0	0.2	0	0
		Zyras humeralis	0	0	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0	0	0	0	0.2	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0.4	0	0.2	0	0	0.2	0	0	0	0
		family? (larva)	0	0	0	0.4	0	0.4	0	0	0.2	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0

CONTROL NO ANTS			Mean invertebrate catch per trap per day										
15/05/95 - 19/05/95 (4 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11
ARACHNIDA	Araneae	Clubionidae	0	0	0.5	0	0	0.25	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0.25	0.25	0.5	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0.5	0.25	0.5	0.25	0 25	0	0.25	0.25
	Acari	family?	3.5	0	0	0.25	1	0	0 5	4 25	0	2	0.5
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0.5	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0.25	0	0
		Philosciidae	0.25	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0.25	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0.25	0.25	0	0.25
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0.25	0	0	0	0	0.25	0	0
	Collembola	Entomobryidae	0.5	0.25	0	3	0	0	0	2	1	0	0.25
		Sminthuridae	0	0	0	0.25	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0.25	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0.5	0	1	0.25	0.25	0	0.75	0.25	0	0
		Empididae	0.25	0.25	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0.25	1	0	0.5	0.25	0	0	0	1	0	0
		Drosophilidae	0	0	0	0	0	0	0	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	0	0	0	0	0	0	0	0	0	0	0
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0.75	0.75	0.75	1	1.5	1.5	0.75	1	0.5	0.75	0
		Staphylinidae	0	0.25	0	0.5	0	0.25	0	0.25	0.25	1	0
		Zyras humeralis	0	0	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0.25	0	0
		family? (larva)	0	0	0	0	0.25	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0.25	0	0

CONTROL NO ANTS			Mean invertebrate catch per trap per day										
10/07/95 - 14/07/95 (4 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0.25	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0.25	0	0	0	0	0.25	0	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0.5	0	0	0	0	0	1.25	0.5	0	0	0
	Acari	family?	0	0	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0.75	0	0	0	0	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	2.5	0.75	0	0.25	1.5	0	0	0	0	0	0
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0.25	0	0	0.25	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0.25	0	0	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0.25	0	0.25	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0.5	0.25	0	0.25	0	0	1.25	0	0	0
		Drosophilidae	0	0	0	0 25	0	0	0	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0.25	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	0	0	0	0	0	0	0	0	0	0	0
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0.75	0	0	0.25	0	0.75	0.5	0	0	0	0
		Staphylinidae	0.25	0	0	0	0	0	1	0	0	0	0
		Zyras humeralis	0	0	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0.5	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0

CONTROL NO ANTS			Mean invertebrate catch per trap per day										
28/08/95 - 01/09/95 (4 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0.25	0	0	0	0	0	0	0.25	0	0	0
	Acari	family?	0	0	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0.5	0	0	0	0	0	0	0	0.5	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	0	0	0	0.25	0.25	0.25	0	0	2 5	0.25	0
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichocendae	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0	0	0.25	0	0	0	0	0	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0.75	0	0	0	0	0.25	0	0	0	0
		Muscidae(+Fanniidae +Sphaerocerldae)	0.75	0	0	0.25	0	0	0	0	0.5	0.25	0.5
		Drosophilidae	0	0.25	0	0	0	0	0	0	0.25	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0.25
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0.25
		family?	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	0	0	0	0	0	0	0	0	0	0	0
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	1	1	1.5	0.5	0	0	0.5	2.25	1.25	0.25	0
		Staphylinidae	0	0	0	0	0	0	0.75	0	1	1	0.5
		Zyras humeralis	0	0	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0

CONTROL NO ANTS			Mean invertebrate catch per trap per day										
08/11/95 - 14/11/95 (6 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0.167	0	0	0	0	0	0	0	0	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0.333	0	0	0.167	0.167	0	0.167	0.167	0.167	0.5	0
	Acari	family?	0	0	0	0	0	0	0	0	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0.167	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0.333	0.333	0	0	0.167	0	0	0	0.333	0	0
	Collembola	Entomobryidae	0.833	0	0	0	0	0	0.167	0	0.167	0.167	0
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0	0	0	0.333	0	0.167	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0.167	0.167	0.167	0.167	0.167	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0.5	0	0	0	0	0.167	0	0.167	0	0	0
		Anisopodidae	0	0.167	0	0	0.167	0	0.833	0.333	0	0	0
		Mycetophilidae (+Sciaridae)	0.167	0	0	0.167	0	0	0	0	0	0.167	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0	0.167	0	0	0.167	0	0.167	0.167
		Drosophilidae	0	0	0	0	0	0	0	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	0	0	0	0	0	0	0	0	0	0	0
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0.167	0	0.5	0.167	0.167	0	0.333	0.5	0	0
		Staphylinidae	0.5	0	0	0	0.167	0.833	0.667	0	0.833	0.5	0.333
		Zyras humeralis	0	0	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0.167	0	0	0
		family? (larva)	0.167	0	0	0.167	0	0	0.167	0	0.333	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0

CONTROL NO ANTS			Mean invertebrate catch per trap per day										
11/02/96 - 21/02/96 (10 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11
ARACHNIDA	Araneae	Clubionidae	0		0	0		0	0	0	0		0
		Lycosidae	0		0	0		0	0	0	0		0
		family?	0		0	0.1		0.1	0	0.1	0		0.1
	Opiliones	Nemastomatidae	0		0	0		0	0	0	0		0
		family?	0		0	0		0	0	0	0		0
	Acari	family?	0		0	0		0	0	0	0.1		0
	Pseudoscorpionida	family?	0		0	0		0	0	0	0		0
CRUSTACEA	Isopoda	Trichonoscidae	0		0	0		0	0	0	0		0
		Porcellionidae	0		0	0		0	0	0	0		0
		Oniscidae	0		0	0		0	0	0	0		0
		Philosciidae	0		0	0		0	0	0	0		0
		family?	0		0	0		0	0	0	0		0
DIPLOPODA	Glomerida	Glomeridae	0		0	0		0	0	0	0		0
	Chordeumatida	Craspedosomatidae	0		0	0		0	0	0	0		0
		Chordeumatidae	0		0	0		0	0	0	0		0
	Polydesmida	Polydesmidae	0		0	0		0	0	0	0		0
	Julida	Julidae	0		0	0		0	0	0	0		0
	unknown	family?	0		0	0		0	0	0	0		0
CHILOPODA		Lithobiidae	0		0	0		0	0	0	0		0
	Geophilomorpha	family?	0		0	0		0	0	0	0		0
INSECTA	Diplura	Campodeidae	0		0	0		0	0	0	0		0
	Collembola	Entomobryidae	0.1		0	0.1		0.1	0	0.2	0 2		0.3
		Sminthuridae	0		0	0		0	0	0	0		0
	Dermaptera	Forficulidae	0.1		0	0		0	0.1	0	0		0
	Hemiptera	Nabidae	0		0	0		0	0	0	0		0
		Reduviidae	0		0	0		0	0	0	0		0
		family?	0		0	0		0	0	0	0		0
	Thysanoptera	family?	0		0	0		0	0	0	0		0
	Homoptera	Aphididae	0		0	0		0	0	0	0		0
		leafhoppers	0		0	0		0	0	0	0		0
	Lepidoptera	family? (micromoth)	0		0	0		0	0	0	0		0
		family? (larva)	0		0	0		0	0	0	0		0
	Diptera	Trichoceridae	0		0	0		0	0	0.1	0		0
		Anisopodidae	0		0	0		0	0	0	0		0
		Mycetophilidae (+Sciaridae)	0		0	0		0.1	0	0	0.1		0.1
		Empididae	0		0	0		0	0	0	0		0
		Phoridae	0		0	0		0	0	0.1	0		0
		Muscidae(+Fanniidae +Sphaeroceridae)	0		0	0		0	0	0	0		0
		Drosophilidae	0.1		0	0		0.1	0	0.1	0		0
		Dolichopodidae	0		0	0		0	0	0	0		0
		Syrphidae	0		0	0		0	0	0	0		0
		Calliphoridae	0		0	0		0	0	0	0		0
		Asilidae	0		0	0		0	0	0	0		0
		family?	0		0	0		0	0	0	0		0
		family? (larva)	0		0	0		0	0	0	0		0
	Hymenoptera	Cynipoidea	0		0	0		0	0	0	0		0
		Chalcidoidea	0		0	0		0	0	0	0		0
		Vespidae	0		0	0		0	0	0	0		0
		family?	0		0	0		0	0	0	0		0
		Formica rufa	0		0	0		0	0	0	0		0
		Myrmica ruginodis	0		0	0		0	0	0	0		0
	Coleoptera	Carabidae	0		0	0		0	0	0	0		0
		Staphylinidae	0.1		0	0.2		0	0	0.5	0		0.1
		Zyras humeralis	0		0	0		0	0	0	0		0
		Elateridae	0		0	0		0	0	0	0		0
		Curculionidae	0		0	0		0	0	0	0.1		0
		Lucanidae	0		0	0		0	0	0	0		0
		Coccinellidae	0		0	0		0	0	0	0		0
		Tenebrionidae	0		0	0		0	0	0	0		0
		Chrysomelidae	0		0	0		0	0	0	0		0
		family?	0		0	0		0	0	0	0		0
		family? (larva)	0.2		0.1	0		0.1	0.1	0.2	0 3		0.2
		nymph?	0		0	0		0	0	0	0		0
	Plecoptera	family?	0		0	0		0	0	0	0		0
GASTROPODA	Pulmonata	Limacidae	0		0	0		0	0	0	0		0
		Helicidae	0		0	0		0	0	0	0		0
OLIGOCHAETA		Lumbricidae	0		0	0		0	0	0	0		0

CONTROL NO ANTS			Mean invertebrate catch per trap per day										
02/04/96 - 08/04/96 (6 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0.167	0	0	0.167	0	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
	Acari	family?	0	0	0	0	0	0	0	0.167	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0	0	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0
	unknown	*family?*	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0.167	0	0	0	0	0	0	0
	Collembola	Entomobryidae	0.667	0	0	0 667	0	0	0	0.167	1.333	0	0.333
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0	0.167	0	0	0	0	0.167	0	0
	Hemiptera	Nabidae	0	0	0	0	0	0	0	0	0	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0	0	0
		Mycetophilidae (+Sciaridae)	0.167	0	0	0	0	0	0.5	0	0	0.333	0.333
		Empididae	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0	0	0	0	0	0	0	0	0
		Drosophilidae	0	0	0	0	0	0	0	0	0	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0.167	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0.167	0	0	0	0	0
		Formica rufa	0	0	0	0	0	0	0	0	0	0	0
		Myrmica ruginodis	0	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0	0	0	0	0	0	0	0	0
		Staphylinidae	0.333	0.167	0	0	0	0	0	0.333	0	0.333	0
		Zyras humeralis	0	0	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0.167	0	0	0	0	0.167	0	0	0	0	0
		family? (larva)	0	0.333	0.333	0.333	0	0.167	0	0.333	0.167	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0

CONTROL NO ANTS			Mean invertebrate catch per trap per day										
23/06/96 - 26/06/96 (3 days)		Pitfall trap Number	1	2	3	4	5	6	7	8	9	10	11
ARACHNIDA	Araneae	Clubionidae	0	0	0	0	0	0	0	0	0	0	0
		Lycosidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0.333	0
	Opiliones	Nemastomatidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	1.333	0.667	0.667	0	1	0
	Acari	family?	0	0.333	0	0	0.333	0.333	0	0.333	0	0	0
	Pseudoscorpionida	family?	0	0	0	0	0	0	0	0	0	0	0
CRUSTACEA	Isopoda	Trichonoscidae	0	0	0	0	0	0	0	0	0	0	0
		Porcellionidae	0	0	0	0	0	0	0	0	0.333	0.333	0
		Oniscidae	0	0	0	0	0	0	0	0	0	0	0
		Philosciidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
DIPLOPODA	Glomerida	Glomeridae	0	0	0	0	0	0	0	0	0	0	0
	Chordeumatida	Craspedosomatidae	0	0	0	0	0	0	0	0	0	0	0
		Chordeumatidae	0	0	0	0	0	0	0	0	0	0	0
	Polydesmida	Polydesmidae	0	0	0	0	0	0	0	0.333	0	0	0
	Julida	Julidae	0	0	0	0	0	0	0	0	0	0	0
	unknown	family?	0	0	0	0	0	0	0	0	0	0	0
CHILOPODA		Lithobiidae	0	0	0	0	0	0	0	0	0	0	0
	Geophilomorpha	family?	0	0	0	0	0	0	0	0	0	0	0
INSECTA	Diplura	Campodeidae	0	0	0	0	0	0	0	0	0	0	0
	Collembola	Entomobryidae	0	0 667	0	0.667	0.333	0.333	0.667	0.333	0	0.333	0.333
		Sminthuridae	0	0	0	0	0	0	0	0	0	0	0
	Dermaptera	Forficulidae	0	0	0.333	0.667	0	0	0	0	0	0	0
	Hemiptera	Nabidae	0.333	0	0	0	0	0	0	0	0.667	0	0
		Reduviidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
	Thysanoptera	family?	0	0	0	0	0	0	0	0	0	0	0
	Homoptera	Aphididae	0	0	0	0	0	0	0	0	0	0	0
		leafhoppers	0	0	0	0	0	0	0	0	0	0	0
	Lepidoptera	family? (micromoth)	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Trichoceridae	0	0	0	0	0	0	0	0	0	0	0
		Anisopodidae	0	0	0	0	0	0	0	0	0.333	0.333	0
		Mycetophilidae (+Sciaridae)	0	3	0.333	0.667	0.333	0.333	0	0.667	0	0	0
		Empididae	0	0	0	0	0	0	0	0	0	0	0
		Phoridae	0	0	0	0	0	0	0	0	0	0	0
		Muscidae(+Fanniidae +Sphaeroceridae)	0	0	0.667	0	0.333	0	0	0	0	0	0
		Drosophilidae	0	1	0.333	0	0	0.333	0	1	0.667	0	0
		Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0
		Syrphidae	0	0	0	0	0	0	0	0	0	0	0
		Calliphoridae	0	0	0	0	0	0	0	0	0	0	0
		Asilidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
		family? (larva)	0	0	0	0	0	0	0	0	0	0	0
	Hymenoptera	Cynipoidea	0	0	0	0	0	0	0	0	0	0	0
		Chalcidoidea	0	0	0	0	0	0	0	0	0	0	0
		Vespidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0	0	0	0	0	0	0	0	0
		Formica rufa	0	0	0	0	0	0	0	0	0	0	0
		Myrmica ruginodis	0.333	0	0	0	0	0	0	0	0	0	0
	Coleoptera	Carabidae	0	0	0.667	0	0	0	0	0	0.333	0	0
		Staphylinidae	0	0	0.333	0.333	0.667	0	2.667	1.333	0	3.333	2
		Zyras humeralis	0	0	0	0	0	0	0	0	0	0	0
		Elateridae	0	0	0	0	0	0	0	0	0	0	0
		Curculionidae	0	0	0	0	0	0.333	0	0	0	0	0
		Lucanidae	0	0	0	0	0	0	0	0	0	0	0
		Coccinellidae	0	0	0	0	0	0	0	0	0	0	0
		Tenebrionidae	0	0	0	0	0	0	0	0	0	0	0
		Chrysomelidae	0	0	0	0	0	0	0	0	0	0	0
		family?	0	0	0.333	0.333	0	0.333	0	0	0.333	0	0
		family? (larva)	0	0	0	0	0	0	0	0 667	0.333	0	0
		nymph?	0	0	0	0	0	0	0	0	0	0	0
	Plecoptera	family?	0	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Pulmonata	Limacidae	0	0	0	0	0	0	0	0	0	0	0
		Helicidae	0	0	0	0	0	0	0	0	0	0	0
OLIGOCHAETA		Lumbricidae	0	0	0	0	0	0	0	0	0	0	0

Appendix O: Feeding habits of invertebrate families found in pitfall trapping

ARACHNIDA	Araneae	Clubionidae	Predatory
		Lycosidae	Predatory
		family?	Predatory
	Opiliones	Nemastomatidae	Predatory
		family?	Predatory
	Acari	family?	Wide range of feeding habit
	Pseudoscorpionida	family?	Predatory
CRUSTACEA	Isopoda	Trichonoscidae	Isopoda feed on decaying plants/animals, moss or bark, few carnivores (Treated as non-predatory)
		Porcellionidae	
		Oniscidae	
		Philosciidae	
		family?	
DIPLOPODA	Glomerida	Glomeridae	Non-predatory
	Chordeumatida	Craspedosomatidae	
		Chordeumatidae	
	Polydesmida	Polydesmidae	
	Julida	Julidae	
	unknown	family?	
CHILOPODA		Lithobiidae	Predatory
	Geophilomorpha	family?	Predatory
INSECTA	Diplura	Campodeidae	Non-predatory
	Collembola	Entomobryidae	Collembola fed in the leaf litter, fungi and decaying plant matter
		Sminthuridae	
	Dermaptera	Forficulidae	Non-predatory
	Hemiptera	Nabidae	Predatory
		Reduviidae	Predatory
		family?	?
	Thysanoptera	family?	Non-predatory
	Homoptera	Aphididae	Non-predatory
		leafhoppers	Non-predatory
	Lepidoptera	family? (micromoth)	Non-predatory
		family? (larva)	Non-predatory
	Diptera	Trichoceridae	Non-predatory
		Anisopodidae	Non-predatory
		Mycetophilidae (+Sciaridae)	Non-predatory
		Empididae	Predatory
		Phoridae	Non-predatory
		Muscidae(+Fanniidae+Sphaeroceridae)	Non-predatory
		Drosophilidae	Non-predatory
		Dolichopodidae	Predatory
		Syrphidae	Non-predatory
		Calliphoridae	Non-predatory
		Asilidae	Predatory
		family?	?
		family? (larva)	?
	Hymenoptera	Cynipoidea	Non-predatory
		Chalcidoidea	Non-predatory
		Vespidae	Predatory
		family?	?
		Formica rufa	Predatory
		Myrmica ruginodis	Predatory
	Coleoptera	Carabidae	Predatory
		Staphylinidae	Predatory
		Zyras humeralis	Predatory
		Elateridae	Non-predatory
		Curculionidae	Non-predatory
		Lucanidae	Non-predatory
		Coccinellidae	Predatory
		Tenebrionidae	Non-predatory
		Chrysomelidae	Non-predatory
		family?	?
		family? (larva)	Predatory
		nymph?	?
	Plecoptera	family?	Non-predatory
GASTROPODA	Pulmonata	Limacidae	Non-predatory
		Helicidae	Non-predatory
OLIGOCHAETA		Lumbricidae	Non-predatory